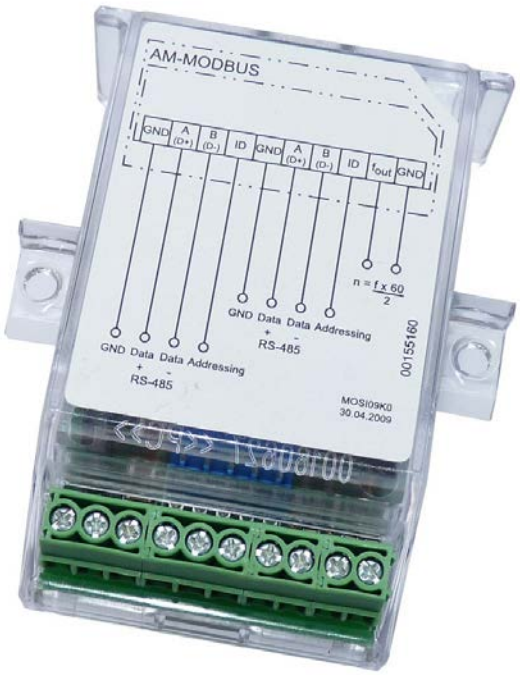
AM-MODBUS(-W)

Communication module for ZIEHL-ABEGG ECblue fans and frequency inverters of the Basic series

Operating Instructions



Keep for reference!

ZIEHL-ABEGG

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1 General notes

1.1 Structure of the operating instructions

These operating instructions only apply in conjunction with the mounting/operating instructions for the device in which this module is installed. The remarks concerning safety, installation and connection described there must be followed!
Before installation and start-up, read this manual carefully to ensure correct use!

1.2 Exclusion of liability

Concurrence between the contents of these operating instructions and the described hardware and software in the device has been examined. It is still possible that non-compliances exist; no guarantee is assumed for complete conformity. To allow for future developments, construction methods and technical data given are subject to alteration. We do not accept any liability for possible errors or omissions in the information contained in data, illustrations or drawings provided.
ZIEHL-ABEGG SE is not liable for damage due to misuse, incorrect use, improper use or as a consequence of unauthorized repairs or modifications.

1.3 FCC / IC Statements (for AM-MODBUS-W modules only)

FCC Compliance (US)
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:(1) this device may not cause harmful interference, and(2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Warning
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

IC Compliance (Canada)
This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

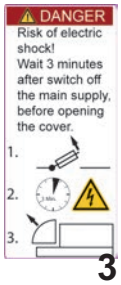
This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

2 Safety instructions

Information
Mounting, electrical connection, and start-up operation may only be carried out by an electrical specialist in accordance with electrotechnical regulations (e.g. EN 50110 or EN 60204)!

Danger due to electric current

- It is generally forbidden to carry out work on electrical live parts. Protection class of the device when open is IP00! It is possible to touch hazardous voltages directly!
- The 5 electrical safety rules must be observed!
- The safe isolation from the supply must be checked using a **two-pole** voltage detector.
- Even after disconnecting the mains voltage, life-threatening charges can appear between the protective ground “PE” and the mains connection.



Waiting period at least 3 minutes!
Opening the device in which the module is to be installed (fan, inverter) is only allowed when the mains power is switched off and after waiting at least three minutes.
Through use of capacitors, danger of death exists even after switching off the device through directly touching the energized parts or due to parts that have become energized due to faults.

3 General description

3.1 Operational area

The add-on module can only be used together with compatible ZIEHL-ABEGG devices.

Note: The AM-MODBUS-W module is intended exclusively for integration and utilisation in host devices (fans and converters) from ZIEHL-ABEGG.

3.2 Function

Access to the MODBUS register is possible via the RS-485 interface for MODBUS RTU.
Menu-guided programming is possible with the hand held terminal type A-G-247NW, the connection can be made via the RS-485 interface (wired) or wirelessly by radio (AM-MODBUS- **W**).

Type	Part-No.	Function
AM-MODBUS	349045	Communication module with RS-485 interface.
AM-MODBUS-W	349050	Communication module with RS-485 interface. Communication by radio (wireless) to the hand held terminal A-G-247NW additionally possible.

Devices with integrated auxiliary module AM-MODBUS(-W) offer the following functions:

- The ECblue fan and the frequency inverter can be communicated with via the module. To program desired functions during start-up or for diagnostics, the module can be inserted fort he required period of time or can be left in the device.
- Devices can be integrated into existing MODBUS-RTU networks. A MODBUS network with several members can be built up, communication is made via MODBUS-RTU.
- The members connected in a network can be addressed automatically. Manual addressing is not necessary!
- Parameter sets can be saved by the module in the terminal type A-G-247NW and transferred to other devices (☞ Operating Instructions Terminal Type A-G-247NW).
- It is possible to save and exchange parameters sets by PC via the USB interface of the terminal type A-G-247NW (☞ Operating Instructions Terminal Type A-G-247NW).
- For ECblue fans tacho output with frequency signal, the evaluation of the signal shows the current fan speed.

3.3 Transport

- The device is packed ex factory to suit the transport method previously agreed.
- Always use the original packaging materials when transporting the device.
- Avoid shocks and impacts to the device during the transport.
- During manual handling the human lifting and carrying restrictions must be observed and adhered to.

3.4 Storage

- The device must be stored in its original packaging in a dry and weather-proof room.
- Avoid exposure to extreme heat and cold.
- Avoid over-long storage periods (we recommend a maximum of one year).

3.5 Disposal / recycling

Disposal must be carried out professionally and environmentally friendly in accordance with the legal stipulations.

4 Mounting the module

Danger due to electric current

- Always read the safety instructions chapter before mounting!
- The terminating device (fan, converter) in which the module is to be installed must be disconnected from the line voltage for at least 3 minutes before opening!

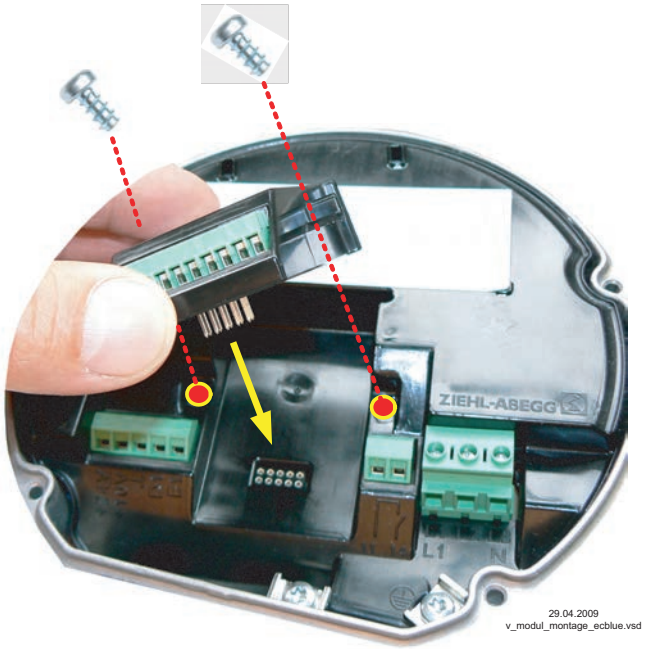
Attention, electrostatic sensitive devices!

- Damage to electronic components by electrostatic charging must be prevented!
- Touch the protective earth connection in the terminal to equalize the potential immediately before removing the module from the packing. This applies regardless of whether the device is already connected to the line.
- Equalize the potential again shortly before installation if the module is not installed immediately after unpacking.
- After unpacking the module, check for possible transport damage and insert it in the slot provided. Do not touch the connection!

▷ Mount the module in the housing with the two enclosed screws (permissible tightening torque M_A = 1.3 Nm).

▷ When an AM-MODBUS-**W** module is installed in a fan or converter from ZIEHL-ABEGG, the enclosed FCC/IC label “AM-MODBUS-W” inside must be stuck to the housing of the terminating device.

Example for mounting the add-on module



Example: Sticking the FCC/IC label “AM-MODBUS-W” inside onto a fan housing.

5 Electrical installation

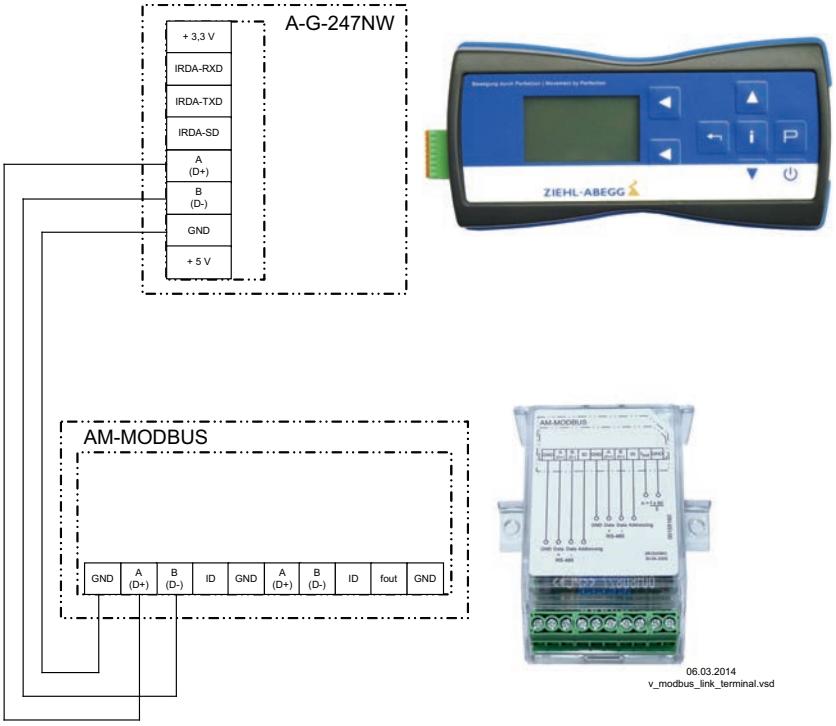
5.1 Safety precautions

Danger due to electric current

- **Work on electric components may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.**
- **It is forbidden to carry out work on electrically live parts.**

5.2 Connection terminal type A-G-247NW for service

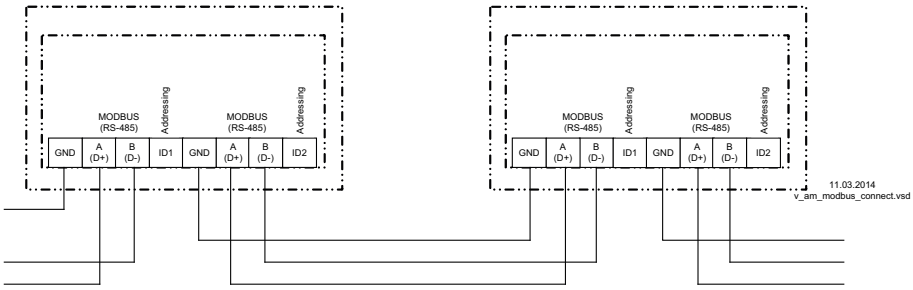
If necessary an external terminal can be connected. This can be e.g. necessary to adapt the pre-setting during start-up.
The connection is made by a 4-wire cable at the terminals: A (D+), B (D-) and GND. E. g. telephone cable type: J-Y (St) Y 2x2x0.6 (or similar), maximum cable length approx. 250 m.



The voltage supply of the terminal is made by the accumulators inserted there or the plug power supply unit.

5.3 RS-485 interface for MODBUS

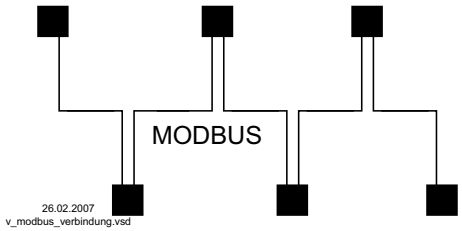
The device comes equipped with a RS-485 interface for networking via MODBUS. Conntection at: “A (D+)”, “B (D-)” and “GND”.



The connections for MODBUS “A (D+)”, “B (D-)” are available double on the module and are connected with each other internally.

Information
- You must ensure correct connection; i.e. “A (D+)” must also be connected on the following devices to “A (D+)”. The same applies to “B (D-)”.
- In addition, a "GND" connection must be established, as dissimilar potential (over 10 V!) will lead to the destruction of the RS-485 interface (e.g. lightning).
- Except the data link “A (D+)”, “B (D-)” and “GND” (for automatic addressing additional “ID1” - “ID2”☞ following chapter) no further cable cores of the data line may be used.
- Do not use wire shield.
- Pay attention to sufficient distance from powerlines and motor wires (min. 20 cm).
- A maximum of 64 members can be directly connected to one another, and another 63 members via a repeater (only for manual addressing i.e. no connection of the terminals “ID1”,“ID2”).

Example for MODBUS connection



The data line must be conducted from one device to the next. No other type of wiring is allowed!
Always use only two wires of one lead (twisted pair) for the connection.

Recommended wire types
1. CAT5 / CAT7 cables
2. J-Y (St) 2x2x0.6 (telephone wire)
3. AWG22 (2x2 twisted pair)

Max allowed wire length 1000 m (CAT5/7 500 m).

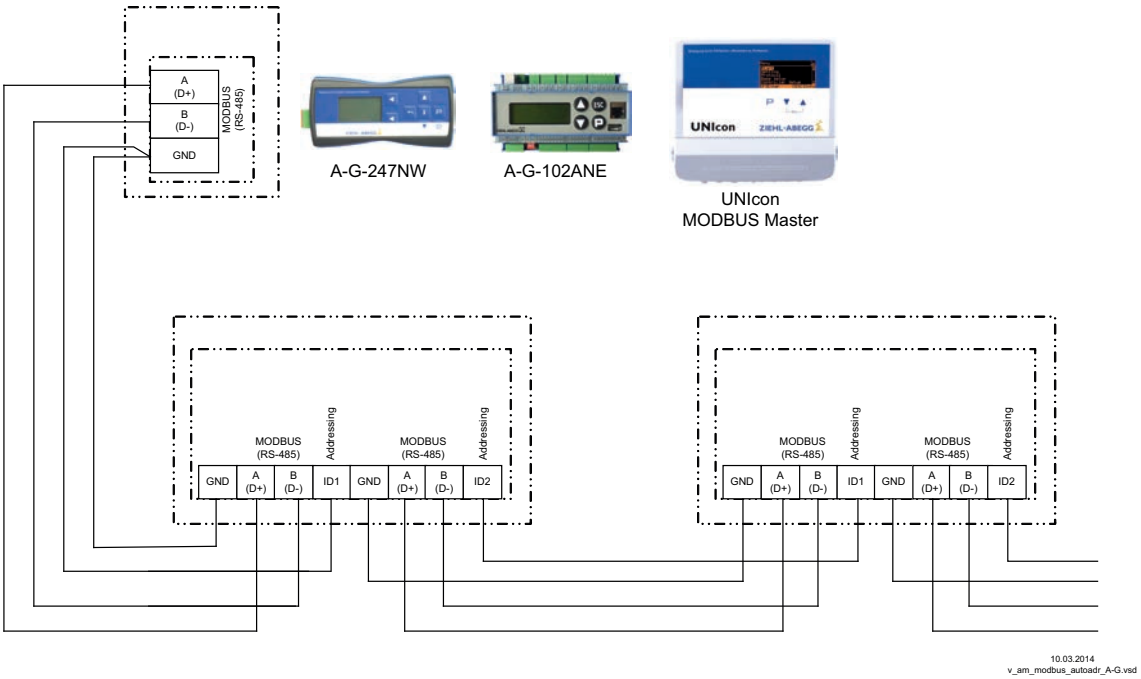
When using telephone flex with four cable cores, we recommend the following allocation:
- A (D+) = red
- B (D-) = black
- ID1 - ID2 = yellow (for automatic addressing)
- GND = white

Default interface parameter
- Baudrate = 19200
- Bits = 8
- Parity = Even
- Stop bits = 1
- Handshake = none

Information
- Addressing is performed by an external terminal or a PC with the appropriate software (automatic addressing ☞ following chapter).
- The MODBUS register description and the information sheet “Network structure of MODBUS” can be requested from our Support Department V-STE for control systems - ventilation.

5.3.1 Automatic addressing

Automatic addressing can be started when the connections “ID1” and “ID2” for “Addressing” are connected with each other additionally next to the bus connection. I. e. it is no longer necessary to address every user manually in the network.



The connection at the terminal is made at the terminals: A (D+), B (D-) and GND.
Connection of the users via the terminals: A (D+), B (D-), GND and ID1 / ID2

Information

- Except the data link “A (D+)”, “B (D-)” the “ID1 - ID2” and the “GND” connection may no further cable cores of the data line be used.
- The connections for the automatic addressing “ID1” and “ID2” are not directly connected with each other internally. These may not be bridged; any order of connection is possible.
- When using the automatic addressing, no repeaters can be used because these do not pass the signal through to the addressing.
- Maximum number of members in automatic addressing:
  - With hand held terminal type A-G-247 and control unit NETcon type A-G-102ANE max. **63** members.
  - With control module UNIcon MODBUS Master max. **32** members.

On the first user that is connected directly to a terminal, MODBUS Master or PC, “GND” and “ID1” or “ID2” must be bridged. This is recognised as a result and occupied by address **1**.
For the following users the connection “ID1” or “ID2” of a user respectively is connected with connection “ID1” or “ID2” of the next user.
The automatic addressing of other users is initiated by the previous user via this connection.

5.4 AM-MODBUS-W Wireless Communication

The type A-G-247NW hand-held terminal can communicate wireless with the type **AM-MODBUS-W** communications module (☞ Operating Instuctions A-G-247NW: AM-MODBUS App's / Configuration Online / Wireless).
In a hard-wired system, wireless communication is primarily designed in order to have a second interface for communicating with the device (e.g., for configuration and diagnostics).
Wireless communication is also used by the MODBUS protocol, so it is necessary to assign an address. **Wireless** and **hard-wired communications use the same address**. The address can be hard-wire assigned via an RS-485.

For pure, wireless communication, it is recommended to assign the address manually.
▷ Switch on the device you want to re-address and establish a connection with address 247.
▷ In “IO Setup”, change the address and then switch this device off again.
▷ Apply the same procedure to the next device.

Radio control key (0 - 9999)
Different from RS-485 communication, wireless communication also has a radio control key (0 - 9999). This radio control key is used to encode the messages and ensures that several networks can be operated in mutually overlapping radio ranges.
For that reason, every wireless MODBUS network should have its own radio control key if there is another wireless MODBUS network in the vicinity.
The factory setting is 9999.
A radio control key with the value 0 switches off encoding.
The device must be switched off to save the new radio control key.
The radio control key must be assigned in the same manner as the assignment of the MODBUS address.
Radio key (Network key) ☞ Menu group “Controller Setup”.

Technical data for wireless Communication:

Radio communication standard:	IEEE 802.15.4
Frequency:	2.4 GHz (not licensed wireless band, like WLAN, Bluethooth) 16 wireless channels, default wierless channel 0
Communications range:	Short-distance radio, within buildings max. 8 m typically 3 - 5m, free field to 25 m, generally strongly dependent on interferences
Type of communication:	Bi-directional, half-duplex
Application protocol:	MODBUS-RTU (max. protocol length 125 Bytes and/or 50 register)
Coding:	Proprietary through 4-digit number
Network structure:	Point - to - point or point - to- mulit point - communication

6 Operating by terminal

6.1 Menu operation

▷ Switch over between actual value* and “Start” with Esc arrow key.
▷ Switch over between “Start” and actual value* with i key.

* *Actual value depending on device type: "Speed" / rpm,, "Frequency" / Hz, "Modulation" / %*

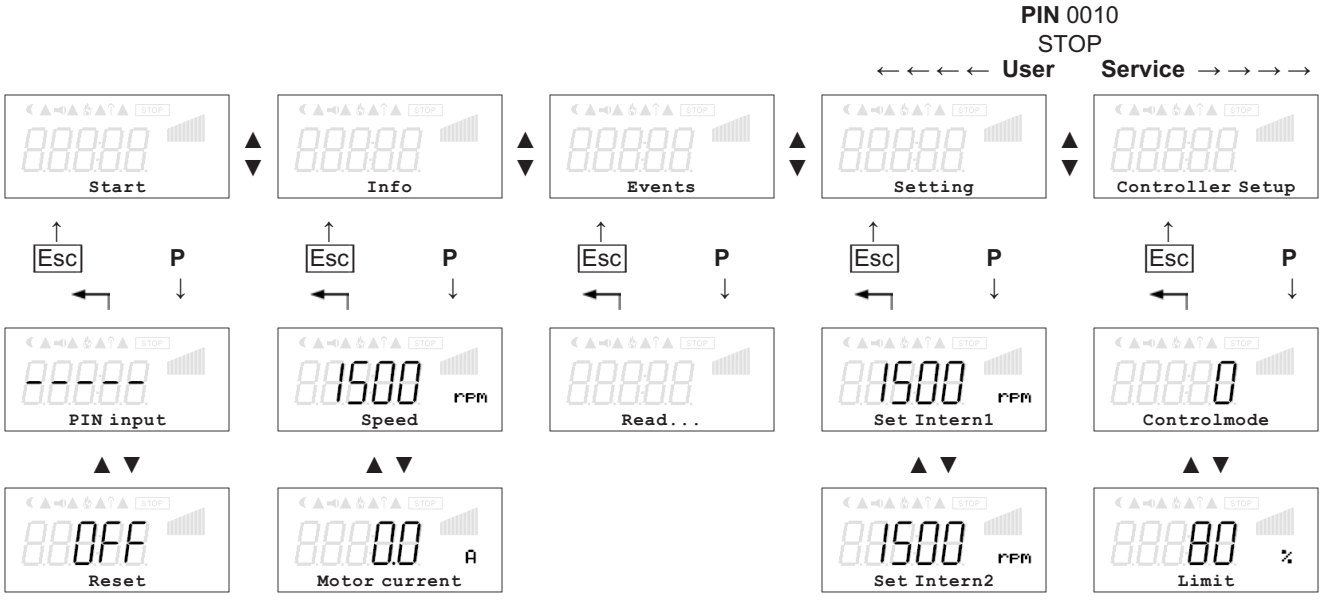
P↓

▷ By pushing the **P**- key one reaches the menu item “Start”.
▷ Return to the menu group “Start” using arrow key Esc.

▲ ▼ ▷ One moves up and down within the menu group using the arrow keys.

Display for english menu language = “GB ”

6.2 Menu structure



Menu dependent on device type

Selection of the menu group (e.g. Setting) to the right through the ▼-key, to the left through the ▼-key.
You can go to the menu items in the menu groups (e.g. Set Intern1) by using the **P** -key. Use the arrow keys to move up and down within the menu group.
The menu groups consist of one area for the user (user menu) and one area for installation (service). The service area can be protected against unauthorized access by using a PIN.
To make adjustments, press the **P** -key after selecting the menu item. If the previously set value starts to flash, it can be adjusted with the ▼ + ▲ keys and then saved with the **P** -key. To exit the menu without making any changes, use the “Esc” key, i.e., the originally set values remain.

7 Programming ECblue Basic by hand held terminal A-G-247NW

7.1 Procedure for commissioning

Sequence	Setting
1	Check if contact for enable is conected to “Digital In 1”. If the device remote control is not required, the two terminals “D1 / 24V” must be bridged or alternatively the function “Enable” deactivate ☞ IO Setup.
2	Check connection and close housing carefully.
3	Turn on mains voltage.

7.2 Menu group Setting

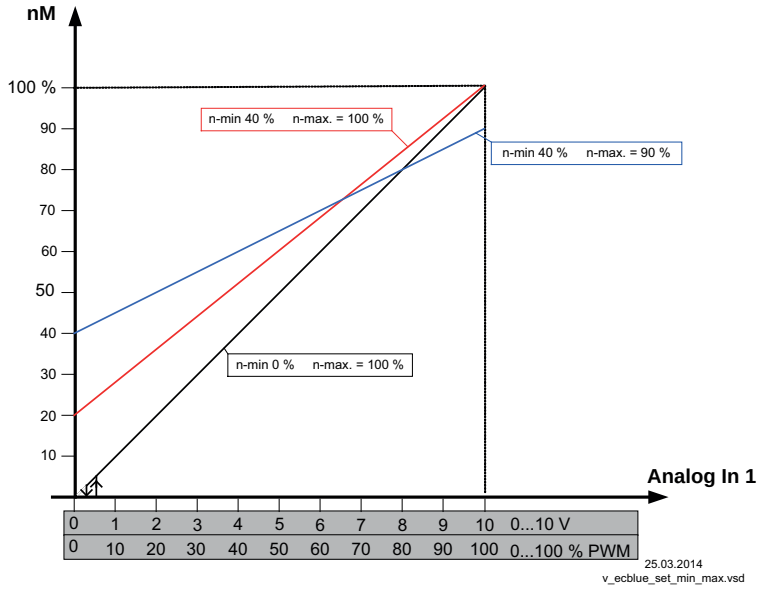
Information

Factory setting: Activation by external signal (0 - 10 V / PWM) at input “E1” (Controlmode = 0 ☞ Controller Setup). I.e. the following settings “Set Intern1”, “Set Intern2”, “Set Intern3” are not active!

	Setting
	Set Intern1 Setting only in Controlmode 4 active (☞ Controller Setup). Via the inputs “D1” / “E1” it is possible to switch to “Default Internal2” or “Default Internal3” (☞ IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	Set Intern2 Setting only in control mode 5 active only in control mode 4, if activated via inputs “D1” / “E1” (☞ Controller Setup / IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	Set Intern3 Setting only in control mode 6 active only in control mode 4, if activated via inputs “D1” / “E1” (☞ Controller Setup / IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	Min. Speed The basic speed is active in every control mode. Setting range: 0...100 % (Rated speed) Factory setting*: 0 %
	Max. Speed The speed limiting is active in every control mode. Setting range: 100 % (Rated speed)... “Min.Speed” Factory setting*: 100 % (Rated speed)

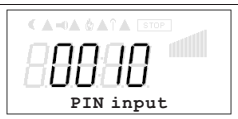
* *Specifications not binding, these values can differe depending on the software version and customer-specific pre-setting.*

Diagram setting signal and speed

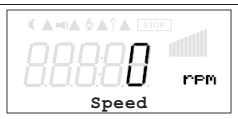
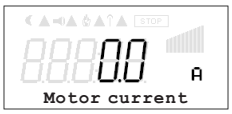
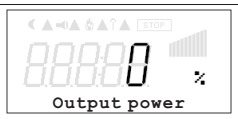


nM: Motor speed
Analog In 1: Speed setting signal
n-min: Min. Speed
n-max: Max. Speed
100 % Rated Speed

7.3 Menu group Start

	Start
	**PIN input** The service menu for the installation can be protected against unintentional changes by a pin code. With further pin codes putting back to pre-setting is possible.
	PIN 0010 Release of the service settings with programmed PIN-Accesslevel [0] (☞ "Controller Setup"). Menu groups Service: "Controller Setup", "IO Setup", "Motor Setup"
	PIN 1234 Opening "setting". Release of the menu group for the user "setting" with programmed PIN-Accesslevel [0] (☞"Controller Setup").
	PIN 9095 Load factory setting (exception, the menu language setting is retained). Only the parameters which are released by the currently set PIN-Accesslevel are loaded.
	Reset Complete re-start of the device
	Software version
	Parameter sets can be saved by the module in the terminal type A-G-247NW and transferred to other devices (☞ Operating Instructions Terminal Type A-G-247NW). Name parameterset with the keys ▼, ▲ + **P** and load in the terminal with the **P**-key.

7.4 Menu group Info

	Info
	Speed
	Display of motor current (Metering precision approx. +/-10%)
	Display of output power0...100 %

7.5 Menu group Controller Setup

	Controller Setup

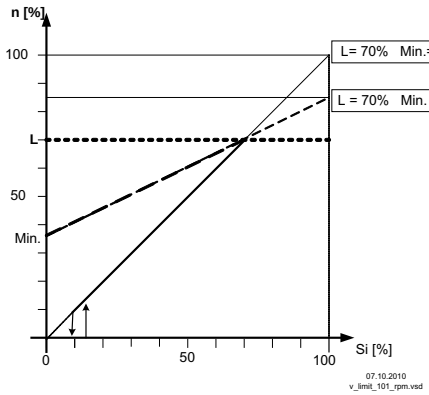
Information
The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

7.5.1 Controlmode

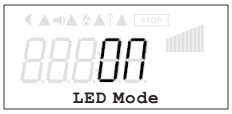
	Type of device modulation.
0	**Factory setting** Control by external signal (0 - 10 V / PWM) at the input “E1”. Switching to fixed speed “Default Internal2” or “Default Internal3” via digital input possible (☞ IO Setup).
1	no function
2	no function
3	no function
4	constant speed “Set Intern1”. Switching to fixed speed “Default Internal2” or “Default Internal3” via digital input possible (☞ IO Setup).
5	Fixed speed “Default Internal2” (without switching possibility to other default).
6	Fixed speed “Default Internal3” (without switching possibility to other default).

7.5.2 Limit

	After allocation of a digital input (☞ IO Setup) an adjustable limitation of the modulation can be activated via a digital input.

"Limit value" = max. possible modulation (e.g. speed reduction during night operation by time switch). Setting range: 0 - 100 % Factory setting: 75 % ≙ max. modulation, i. e. no limit.	Limit (idealized principle diagram)  *n [%] Motor speed* *L Limit* *Si Setting signal speed*

7.5.3 LED Mode



ON	Status LED in ECblue active i.e. operating conditions are indicated by flash code (factory setting).
OFF	Status LED not active, i.e. always OFF.

7.5.4 PIN-Accesslevel

The PIN-Accesslevel determines for which setting ranges a PIN must be entered.

PIN-Accesslevel	Function
2	**Factory setting** All menu groups are visible, settings are possible without a PIN.
1	• The menu group "Setting" is free, i.e. changes are possible without a PIN. • **PIN 0010**: for changes in the menu groups: "Controller Setup", "IO Setup" and "Motor Setup" (these menu groups are not visible without a PIN).
0	**All settings are only possible after entering a PIN.** • **PIN 1234** for changes in the menu group: "Setting" • **PIN 0010**: for changes in the menu groups: "Controller Setup", "IO Setup" and "Motor Setup" (these menu groups are not visible without a PIN).

Information

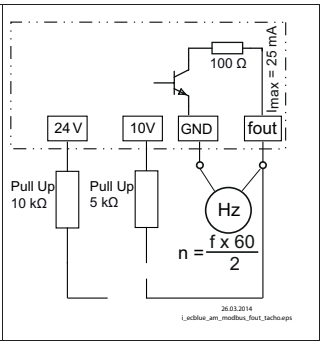
Changes for the PIN protection which effect a reduced access right only become active after switching off the device or executing the "Reset" (☞ Start menu group) function.

7.5.5 AM-MODBUS-W Wireless Communication

Parameter AM-MODBUS- W for the connection via radio to the hand held terminal A-G-247NW (☞ Installation / AM-MODBUS-W wireless communication) .

	Network Key (Radio key) Setting range: 0000 -9999 Factory setting: 9999
	Wireless channel Setting range: 0 - 15 Factory setting: 0

7.5.6 Tacho output f_{out}

	Speed output : Tacho output = ON Via the output "f_{out}" the current motor speed can be output. With the voltage supply "10 V" / "24 V" (from the board of the basic unit) a frequency can be measured by a pull-up resistor at the output "f_{out}" which corresponds to the speed of the motor (duty cycle 50 : 50). Example: 10 Hz x 60 / 2 = 300 rpm	

7.6 Menu group IO Setup

	IO Setup

Information

The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

7.6.1 Digital inputs "D1" ("E1" *)

	Different functions can be assigned to the digital inputs "D1" and "E1"*. Activation via floating contacts (a low voltage of approx. 24 V DC is connected). "D1" is programmed for the "Enable" function at the factory.
	For inverting switch to "ON". The input inversion is set at the factory to "OFF" (when a function is programming).

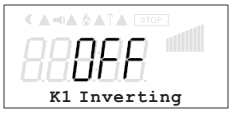
* *If the analogue input "E1" is not required for specifying the fan speed, this can be used as a digital input (☞ E1 function). The same functions can be assigned for "E1" as for "D1".*

Attention!

Never apply line voltage to the digital input!

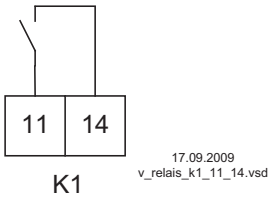
Function	Description
OFF	No function
1D	**Enable ON / OFF (factory setting)** Remote ON/OFF (electronic switch-off) by potential-free contact. The power unit is switched off electronically, the device can still be operated in the switched-off state after pressing the “Esc” key combination. Signal inputs and outputs remain active. A programmed alarm relay (factory set “K1 function” = 2K) does not report the switch-off. **Attention!** No disconnection (no potential isolation in accordance with VBG4 §6) in remote control of the device!
3D	**Limit ON / OFF** ☞ Controller Setup / Limit
5D	**Set Intern2** Fixed speed “Default Internal2” active. Function with selected “control mode”: 0, 1, 2 , 3 (☞ “Controller Setup”). With simultaneous activation of “Default Internal3” with function 6D , 5D has priority).
6D	**Set Intern3** Constant speed “Set Intern3”, also with selected “control mode”: 0 (☞ “Controller Setup”).
13D	**Switch over direction of rotation** Switch over between direction of rotation “RIGHT” = CW and direction of rotation “LEFT” CCW . When“switching”over via a digital input, the device works with the opposite direction of rotation than the one set in Motor Setup. If the rotary direction is reversed with an available modulation, it is initially reduced to “0” (disconnected) and subsequently increased back to the default value.
15D	**Smoke extraction: Switch off temperature management, operation at max. speed** To make the ECblue as durable as possible, the devices have active temperature management. The modulation is reduced when internal temperature limits are exceeded. In venting systems in which the fan must run at max. speed in the event of a fire, the temperature management can be switched off by a digital input. At the same time, the fan is operated independently of the speed default for regular operation at maximum speed. The function is activated at the digital input with the contact open (at factory setting D1/E1 Inverting = OFF) so that the maximum speed of the fan is also possible with the line to the digital input interrupted in case of fire. **Attention!** The device and its internal components are no longer protected against overtemperature when this function is activated (this affects the life installation instructions ECblue). The motor protection function by connected thermal protector is no longer effective!

7.6.2 Relay outputs “K1”

	Various functions can be allocated to the relay outputs “K1”. This is preset at the factory for fault indication.
	Switch to “ON” for inversion (switch-time response depends on the allocated function). Fundamentally, the relay can only become operative if the electronic’s voltage supply is functioning. At least 2 current phases must be present! The factory preset is the inversion of relay “K1” to “OFF” (if a function has been programmed).

Function	Description
OFF	**No function** Relays remain always de-energized .

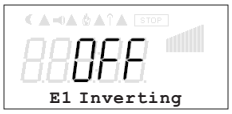
1K	**Operating indication** Operation without fault, reports enable “OFF”.
2K	**Fault indication (factory setting)** Pulled up in operation without fault, with release “OFF” not dropped out. Drops out at: line fault, motor fault, etc. ☞ Events / Fault indications
4K	**Limit** Alarm when the speed exceeds the value set under “Default Internal3” (☞ menu group “Setting”) (output power > 0 %). The function is active in every control mode (☞ menu group: “Controller Setup”).
17K	no function



K1
1 = energized, terminals 11 - 14 bridged
0 = de-energized 11 - 14 not bridged

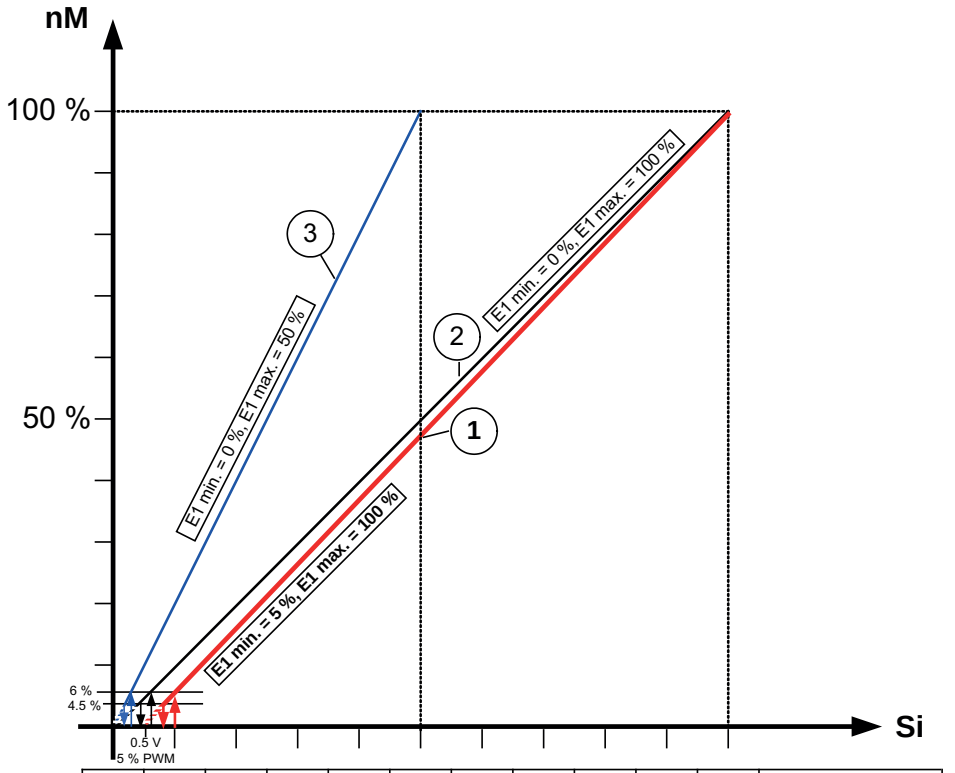
Function	**Status Controller**	**K1** 1 = energized 0 = de-energized	
		Inverting	
		OFF	ON
1K	Operation without fault, line supply okay	**1**	0
2K	Fault with indication by relay	**0**	1
4K	Exceed Frequency / Speed > setting “Set Intern3”	**1**	0

7.6.3 Input “E1”

	E1 Function 1E (factory setting) = speed setting by external signal (0 - 10 V / PWM). For settings via 1E “E1” operates like “D1” as a digital input (☞ digital inputs / function).
	**E1 Inverting** Factory setting inverting to “OFF”. For control with inverted setting signal switch to “ON” (setting signal: 10 - 0 V).

	E1 min. Value of the input signal at which the controller starts at minimum modulation. Setting range: 0 - 100 % Factory setting: 5 %
	E1 max. Value of the input signal at which the maximum modulation of the controller is reached. Setting range: 0 - 100 % Factory setting: 100 %

Diagram setting signal and motor speed



nM Motor speed
100 % Rated Speed
6 % Height of start speed
4.5 % Height of stop speed
0.5 V / 5 % PWM Value start analog input (factory setting)
Si Speed setting signal 0...10 V / 0...100 % PWM

1	**Factory setting**: E1 min. = 5 %, E1 max. = 100 % 0.5...10 V ≙ 0...100 % speed setting I. e. at a setting signal of approx. 1 V the motor starts with 6 % of the rated speed.
2	Example: E1 min. = 0 %, E1 max. = 100 % 0...10 V ≙ 0...100 % speed setting
3	Example: E1 min. = 0 %, E1 max. = 50 % 0...5 V ≙ 0...100 % speed setting

7.6.4 MODBUS communication watchdog

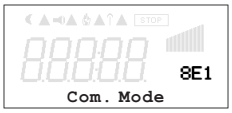
The MODBUS communication watchdog defines the behaviour in case of a communication fault.

	Watchdog Time If the device receives no message in the time window, a definable function is executed. Watchdog time in seconds. Setting range: 0 - 255 sec. Factory setting: 0 sec. = off

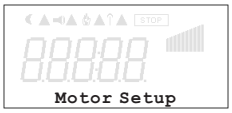
	Watchdog Mode Watchdog Mode: 0: No function (default) = OFF from FW 13 1: Fault (K1 function, h15) in case of communication fault (WDT) 2: Constant speed 1 * in case of communication fault (WDT) 3: Fault + constant speed 1 * in case of communication fault (WDT) 4: Fault by E1 Fault ** (only ECblue) 5: constant speed 1 by E1 Fault (only ECblue) 6: Fault constant speed 1 in case of E1 fault (only ECblue)
	* in this condition it is possible by digital input function 5, 6 or digital control function to change between the constant speeds (Holding register h4). ** E1 fault is triggered when E1 falls below E1 Min x 0.5. E1 fault is cancelled when E1 rises above E1 Min x 0.9.

7.6.5 Networking via MODBUS

It is possible to network several devices with each other. The device uses the MODBUS-RTU as the protocol for the RS-485 interface.

	Bus Address The device address is factory set to the highest available MODBUS address: 247. Setting range MODBUS Address: 1 - 247.
	UART Baudrate Setting transfer rate Valid values: 4,800, 9,600, 19,200 Factory setting: 19200
	**UART Mode** Setting transfer format Valid values: 8O1, 8N1, 8E1 Factory setting: 8E1

7.7 Menu group “Motor Setup”

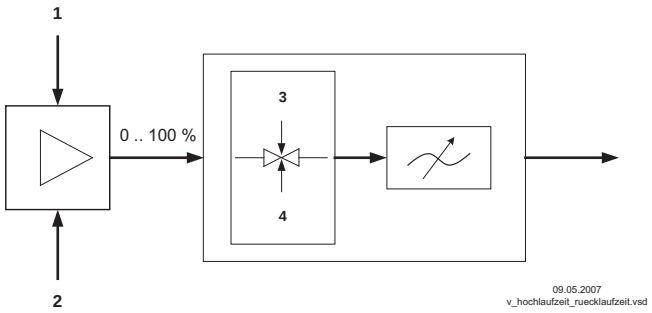
	**Motor Setup**

Parameter	Factory setting	User Setting	
Rated Speed	1500 *		
MotorRatedCurr.	6.3 A *		***The following controller presets are dependent on the respective motor design.**
Rampup time	60 sec		**These are shown for informational purposes and must only be changed after consultation with ZIEHL-ABEGG and entering a password.**
Rampdown time	60 sec		
Rolling direct.	CW *		
motorheat value	OFF *		• Rated Speed • MotorRatedCurr. • Rolling direct. • Value motorheating
Suppression1	OFF		
Range1 min.	100 rpm		
Range1 max.	200 rpm		
Suppression2	OFF		
Range2 min.	400 rpm		
Range2 max.	500 rpm		
Suppression3	OFF		
Range3 min.	700 rpm		
Range3 max.	800 rpm		

7.7.1 Setting for Rampup time and Rampdown time

By separate menus for Rampup time and Rampdown time an adjustment is possible to individual system conditions.
This function is switched behind the actual controller function.

	Rampup time Time setting in which the automatic controller output from 0 % to 100 % rises. Setting range: 0...250 sec. Factory setting: 10 / 20 / 30 / 40 sec. (depending on device type)
	Rampdown time Time setting in which the automatic controller output from 100 % to 0 % reduces. Setting range: 0...250 sec. Factory setting: 10 / 20 / 30 / 40 sec. (depending on device type)

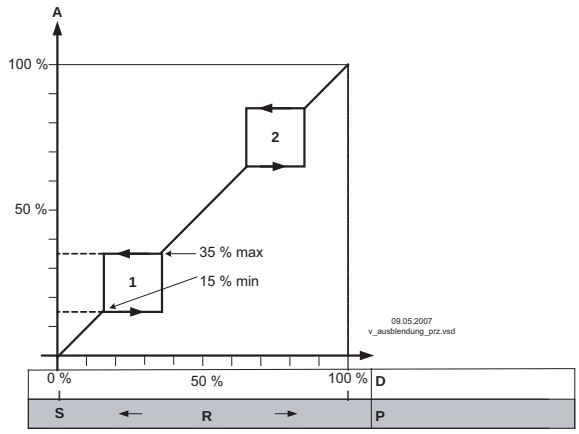


1 external Signal
2 Setting
3 Rampup time
4 Rampdown time

7.7.2 Suppression of speeds

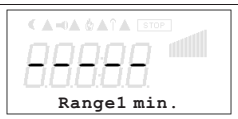
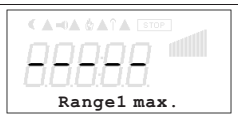
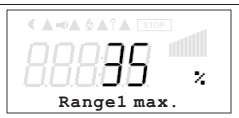
Suppression of up to three speed ranges.
Under certain circumstances, it is possible to prevent disturbing noises that can arise at certain speeds due to resonances.

Example for suppression of 2 ranges (Idealized principle diagram)



Setting depending on device type
in: %, Hz, rpm

A Modulation
S Setpoint
R Pband
D Speed controller: setting signal
P P-controller: control deviation

	→	Factory setting no suppression active = “OFF”	→	
	→	Setting for “Range1 min.” Setting range: “Shutdown Freq.” - “Range 1 max.”	→	
	→	Setting for “Range1 max.” Setting range: “Range 1 max.” - “Max. Frequency”	→	
	→	Identical procedures for Suppression2 and Suppression3, as far as desired	→	etc.

8 Programming Fcontrol Basic by hand held terminal A-G-247NW

8.1 Procedure for commissioning

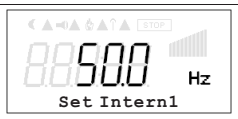
Sequence	Setting		
1	Check if Thermostats or Thermistors of the motor are connected to input “TB/TP In”. If the motor protection function of the device is not neccesary the both terminals “TB / TP” have to be bridged.		
2	Check if contact for enable is conected to “Digital In 1”. If the device remote control is not required, the two terminals “D1 / 24V” must be bridged or alternatively the function “Enable” deactivate ☞ IO Setup.		
3	Check connection and close housing carefully.		
4	Turn on mains voltage.		
5	The **Motor Setup** factory installed values are for variable voltage external rotor motors **400 V / 50 Hz**. After checking of the motor data the setting are to be adapted if necessary.		
	Motor rated voltage (see Rating plate)	Setting **Edgefrequency**	Setting **Max. Frequency**
	3 ~ 400 V, 50 Hz	**48.5 Hz**	**50 Hz**
	3 ~ 400 V, 50/60 Hz	48.5 Hz	60 Hz
	3 ~ 400 V, 60 Hz	57 Hz	60 Hz
	Additional settings ☞Motor Setup.		
Settings for U/f characteristic can only be made when no motor modulation is present!			
▷ Switch off via a digital input for remote control (enable= OFF). ▷ Reduce speed setting signal or setting value to “0” with the display depending on the control mode.			

8.2 Menu group Setting

Information

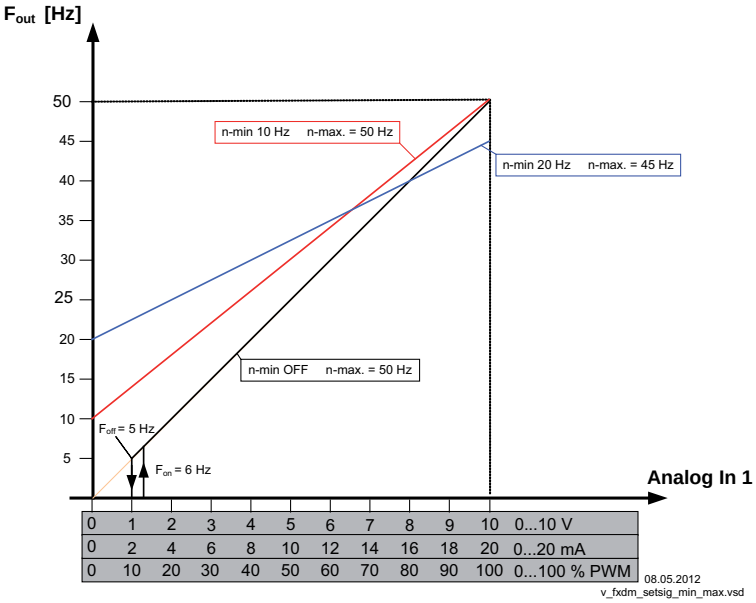
- **Factory setting**: Activation by external signal (0 - 10 V / PWM) at input “E1” (control mode = 0 ☞ Controller Setup). I.e. the following settings “Set Intern1”, “Set Intern2”, “Set Intern3” are not active!
- The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

Information

	Setting
	**Set Intern1** Setting only in Controlmode 4 active (☞ Controller Setup). Via the inputs “D1” / “E1” it is possible to switch to “Default Internal2” or “Default Internal3” (☞ IO Setup). Setting range manual speed setting: “Min. Speed” - “Max. Speed” Factory setting: 50.0 Hz (≙ Setting “Max. Speed”)
	Set Intern2 Setting only in control mode 6 active only in control mode 4, if activated via inputs “D1” / “E1” (☞ Controller Setup / IO Setup). Setting range manual speed setting: “Min. Speed” - “Max. Speed” Factory setting: 50.0 Hz (≙ Setting “Max. Speed”)

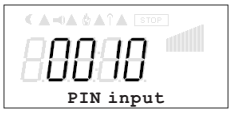
	Set Intern3 Setting only in control mode [6] active only in control mode [4], if activated via inputs "D1" / "E1" (☞ Controller Setup / IO Setup). Setting range manual speed setting: "Min. Speed" - "Max. Speed" Factory setting: 50.0 Hz (≙ Setting "Max. Speed")
	Min. Speed (basic speed only when needed) Setting range: 0... "Max. Frequency" (☞ Motor Setup). Factory setting: 0.0 Hz Active in every control mode, priority by "Max. speed".
	Max. Speed (speed limitation only when needed) Setting range: "Max. Frequency" (☞ Motor Setup)... "Min. Speed" Factory setting: 50.0 Hz Active in every control mode! Settings by "Max. frequency" are possible but are not made!

Diagram setting signal and output frequency



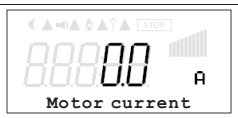
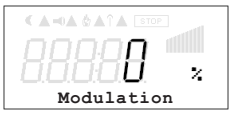
Fout: Output frequency
Analog In: Speed setting signal
n-min: Min. Speed
n-max: Max. Speed
Foff: Shutdown Freq.
Fon: Switch on Freq.

8.3 Menu group Start

	Start
	**PIN input** The service menu for the installation can be protected against unintentional changes by a pin code. With further pin codes putting back to pre-setting is possible.
	PIN 0010 Release of the service settings with programmed PIN-Accesslevel [0] (☞ "Controller Setup"). Menu groups Service: "Controller Setup", "IO Setup", "Motor Setup"
	PIN 1234 Opening "setting". Release of the menu group for the user "setting" with programmed PIN-Accesslevel [0] (☞"Controller Setup").

	PIN 9095 Load factory setting (exception, the menu language setting is retained). Only the parameters which are released by the currently set PIN-Accesslevel are loaded.
	Reset Complete re-start of the device
	Software version
	Parameter sets can be saved by the module in the terminal type A-G-247NW and transferred to other devices (☞ Operating Instructions Terminal Type A-G-247NW). Name parameterset with the keys ▼, ▲ + **P** and load in the terminal with the **P**-key.

8.4 Menu group Info

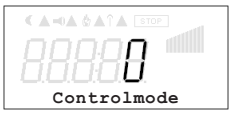
	Info
	Inverter output frequency.
	Display of motor current (Metering precision approx. +/-10%)
	Device modulation

8.5 Menu group Controller Setup

	Controller Setup

Information
The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

8.5.1 Controlmode

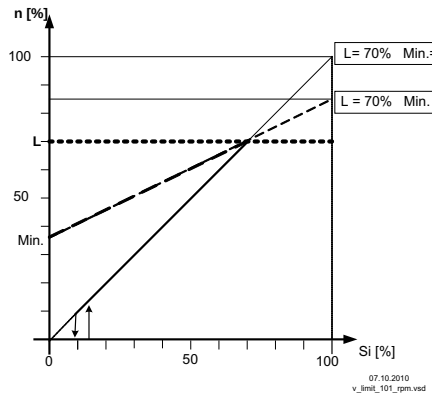
	Type of device modulation.
0	**Factory setting** Control by external signal (0 - 10 V / PWM) at the input “E1”. Switching to fixed speed “Default Internal2” or “Default Internal3” via digital input possible (☞ IO Setup).
1	no function
2	no function
3	no function
4	constant speed “Set Intern1”. Switching to fixed speed “Default Internal2” or “Default Internal3” via digital input possible (☞ IO Setup).
5	Fixed speed “Default Internal2” (without switching possibility to other default).
6	Fixed speed “Default Internal3” (without switching possibility to other default).

8.5.2 Limit

	After allocation of a digital input (☞ IO Setup) an adjustable limitation of the modulation can be activated via a digital input.

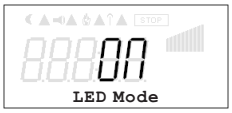
“Limit value” = max. possible modulation (e.g. speed reduction during night operation by time switch).
Setting range: 0 - 100 %
Factory setting: 75 % ≙ max. modulation, i. e. no limit.

Limit (idealized principle diagram)



n [%] Motor speed
L Limit
Si Setting signal speed

8.5.3 LED Mode

	ON	Status LED in ECblue active i.e. operating conditions are indicated by flash code (factory setting).
	OFF	Status LED not active, i.e. always OFF.

8.5.4 PIN-Accesslevel

	The PIN-Accesslevel determines for which setting ranges a PIN must be entered.

PIN-Accesslevel	Function
2	**Factory setting** All menu groups are visible, settings are possible without a PIN.
1	• The menu group “Setting” is free, i.e. changes are possible without a PIN. • **PIN 0010**: for changes in the menu groups: “Controller Setup”, “IO Setup” and “Motor Setup” (these menu groups are not visible without a PIN).
0	**All settings are only possible after entering a PIN.** • **PIN 1234** for changes in the menu group: “Setting” • **PIN 0010**: for changes in the menu groups: “Controller Setup”, “IO Setup” and “Motor Setup” (these menu groups are not visible without a PIN).

Information
Changes for the PIN protection which effect a reduced access right only become active after switching off the device or executing the “Reset” (☞ Start menu group) function.

8.5.5 AM-MODBUS-W Wireless Communication

Parameter AM-MODBUS- W for the connection via radio to the hand held terminal A-G-247NW (☞ Installation / AM-MODBUS-W wireless communication) .

	Network Key (Radio key) Setting range: 0000 -9999 Factory setting: 9999
	Wireless channel Setting range: 0 - 15 Factory setting: 0

8.6 Menu group IO Setup

	IO Setup

Information
The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

8.6.1 Digital inputs “D1”(“E1” *)

	Different functions can be assigned to the digital inputs “D1” and “E1”*. Activation via floating contacts (a low voltage of approx. 24 V DC is connected). “D1” is programmed for the “Enable” function at the factory.
	For inverting switch to “ON”. The input inversion is set at the factory to “OFF” (when a function is programming).

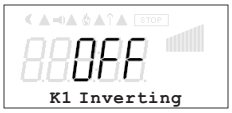
* *If the analogue input “E1” is not required for specifying the fan speed, this can be used as a digital input (☞ E1 function). The same functions can be assigned for “E1” as for “D1”.*

Attention!
Never apply line voltage to the digital input!

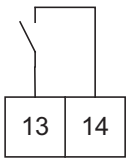
Function	Description
OFF	No function
1D	**Enable ON / OFF (factory setting)** Remote ON/OFF (electronic disconnection) and Reset after a motor malfunction via floating contact. The power section is electronically disconnected. Operation of the device is still possible after pressing the “Esc” hotkey combination in switched-off condition. Signal- in and outputs remain active. A programmed alarm relay (factory set “K1 function” = 2K) does not report the switch-off. **Attention!** No disconnection (no potential isolation in accordance with VBG4 §6) in remote control of the device!
3D	**Limit ON / OFF** ☞ Controller Setup / Limit
5D	**Set Intern2** Fixed speed “Default Internal2” active. Function with selected “control mode”: 0, 1, 2 , 3 (☞ “Controller Setup”). With simultaneous activation of “Default Internal3” with function 6D, 5D has priority).
6D	**Set Intern3** Constant speed “Set Intern3”, also with selected “control mode”: 0 (☞“Controller Setup”).
13D	**Switch over direction of rotation** Switch over between direction of rotation “RIGHT” = CW and direction of rotation “LEFT” CCW. When“switching”over via a digital input, the device works with the opposite direction of rotation than the one set in Motor Setup. If the rotary direction is reversed with an available modulation, it is initially reduced to “0” (disconnected) and subsequently increased back to the default value.

15D	**Smoke extraction: Switch off temperature management, operation at max. speed** To make the ECblue as durable as possible, the devices have active temperature management. The modulation is reduced when internal temperature limits are exceeded. In venting systems in which the fan must run at max. speed in the event of a fire, the temperature management can be switched off by a digital input. At the same time, the fan is operated independently of the speed default for regular operation at maximum speed. The function is activated at the digital input with the contact open (at factory setting D1/E1 Inverting = OFF) so that the maximum speed of the fan is also possible with the line to the digital input interrupted in case of fire. **Attention!** The device and its internal components are no longer protected against overtemperature when this function is activated (this affects the life installation instructions ECblue). The motor protection function by connected thermal protector is no longer effective!

8.6.2 Relay outputs “K1”

	Various functions can be allocated to the relay outputs “K1”. This is preset at the factory for fault indication.
	Switch to “ON” for inversion (switch-time response depends on the allocated function). Fundamentally, the relay can only become operative if the electronic’s voltage supply is functioning. At least 2 current phases must be present! The factory preset is the inversion of relay “K1” to “OFF” (if a function has been programmed).

Function	Description
OFF	**No function** Relays remain always de-energized.
1K	**Operating indication** Operation without fault, reports enable “OFF”.
2K	**Fault indication (factory setting)** Pulled up in operation without fault, with release “OFF” not dropped out. Drops out at: line fault, motor fault, etc. ☞ Events / Fault indications
4K	**Limit** Alarm when the speed exceeds the value set under “Default Internal3” (☞ menu group “Setting”) (output power > 0 %). The function is active in every control mode (☞ menu group: “Controller Setup”).
17K	no function



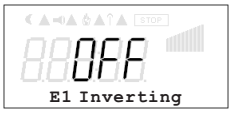
K1

K1
1 = energized, terminals 13 - 14 bridged
0 = de-energized 13-14 not bridged

Function	Status Controller	K1 1 = energized 0 = de-energized	
		Inverting	
		OFF	ON
1K	Operation without fault, line supply okay	**1**	0
2K	Fault with indication by relay	**0**	1
4K	Exceed Frequency / Speed > setting “Set Intern3”	**1**	0

8.6.3 input “E1”

E1 Function
1E (factory setting) = speed setting by external signal (0 - 10 V / PWM).
For settings via 1E “E1” operates like “D1” as a digital input (☞digital inputs / function).



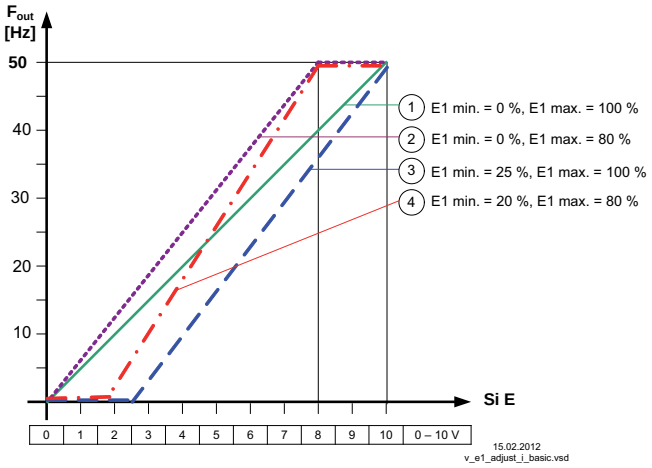
E1 Inverting
Factory setting inverting to “OFF”.
For control with inverted setting signal switch to “ON” (setting signal: 10 - 0 V).

E1 Min.
Value of the input signal at which the controller starts at minimum modulation.
Setting range: 0 - 100 %
Factory setting: 5 %

E1 max.
Value of the input signal at which the maximum modulation of the controller is reached.
Setting range: 0 - 100 %
Factory setting: 100 %

Example for signal adaption

Idealized principle diagrams for setting: “Min. Speed” = 0.0 Hz and “Max. Speed” = 50.0 Hz



Fout Output frequency
Si E Setting signal speed

Example: “E1 min.” = 20 %
The controller begins only at approx. 20% higher signal with minimal modulation.

Example: “E1 max.” = 80 %
The modulation rises linear to 100% modulation with 80% setting signal.

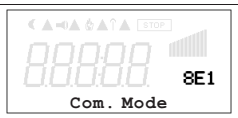
8.6.4 MODBUS communication watchdog

The MODBUS communication watchdog defines the behaviour in case of a communication fault.

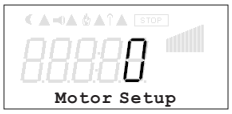
	Watchdog Time If the device receives no message in the time window, a definable function is executed. Watchdog time in seconds. Setting range: 0 - 255 sec. Factory setting: 0 sec. = off
	Watchdog Mode Watchdog Mode: 0: No function (default) = OFF from FW 13 1: Fault (K1 function, h15) in case of communication fault (WDT) 2: Constant speed 1 * in case of communication fault (WDT) 3: Fault + constant speed 1 * in case of communication fault (WDT) 4: Fault by E1 Fault ** (only ECblue) 5: constant speed 1 by E1 Fault (only ECblue) 6: Fault constant speed 1 in case of E1 fault (only ECblue)
	* in this condition it is possible by digital input function 5, 6 or digital control function to change between the constant speeds (Holding register h4). ** E1 fault is triggered when E1 falls below E1 Min x 0.5. E1 fault is cancelled when E1 rises above E1 Min x 0.9.

8.6.5 Networking via MODBUS

It is possible to network several devices with each other. The device uses the MODBUS-RTU as the protocol for the RS-485 interface.

	Bus Address The device address is factory set to the highest available MODBUS address: 247. Setting range MODBUS Address: 1 - 247.
	UART Baudrate Setting transfer rate Valid values: 4,800, 9,600, 19,200 Factory setting: 19200
	**UART Mode** Setting transfer format Valid values: 8O1, 8N1, 8E1 Factory setting: 8E1

8.7 Menu group “Motor Setup”

	**Motor Setup**

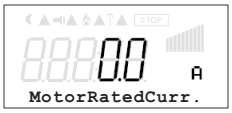
Information

The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

Attention!

Settings for U/f characteristic may only be made when no motor modulation is present!

8.7.1 Setting motor rated current

	**MotorRatedCurr.** Possible setting for the motor rated current. The setting for the “DC brake level” (☞ setting brake behaviour) refers to this setting. Setting range: 0.0...device rated current / A Factory setting: device rated current

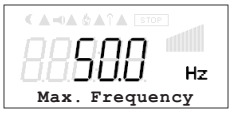
8.7.2 Setting motor rated voltage

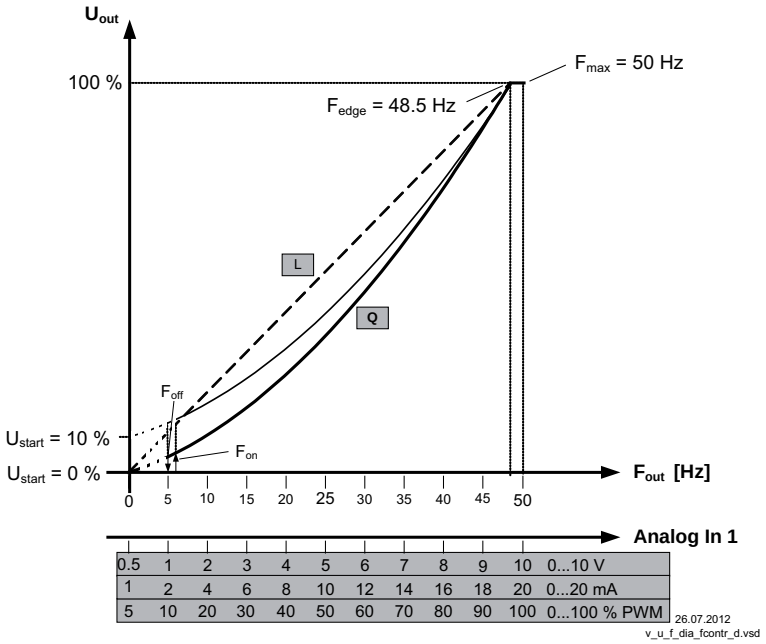
	MotorRatedVolt. **When commissioning, you must set the motor to the rated voltage stated on the rating plate.** An adaptation can be made if the motor rated-voltage as the applied mains voltage is lower (e.g. 3 ~ 230 V motor on 3 ~ 400 V mains). Verify the output voltage using suitable measuring instruments. Setting range: 0...500 V Factory setting: 400 V

8.7.3 Adjustment of the U/f curve

Information

The device comes supplied with a preprogrammed square characteristic curve for the operation of fans.
In the case of voltage-controllable motors and square load torque-moments (e.g. fans and pump operation), an optimal speed control is generally achieved through this.
In systems in which high dynamics are required, switchover to a linear characteristic must take place. Generally speaking, if the load characteristic is not known as a definite value, the linear characteristic should be set. In the case of linear characteristic curves, the motor achieves full torque throughout the entire speed range. For this, a thermal overload of the motor must be prevented through suitable measures (complete motor protection through using thermocontact or PTC thermistor-monitoring).

	Edgefrequency The maximum output voltage is attained during break edge frequency. Adjustment range: 1.0 - 120.0 Hz Factory setting: 48.5 Hz
	In the case of special settings with “Edge frequency” > “Max. frequency”, due to higher power losses it is possible that automatic power reduction occurs (☞ Messages and trouble shooting “Temp. Manager”).
	**Max. Frequency** Above the Edgefrequency, the frequency is merely increased up to the Maximum frequency. Adjustment range: 1.0 - 120 Hz Factory setting: 50.0 Hz

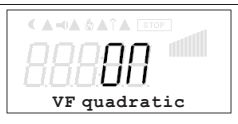


Uout Output voltage
Fout: Output frequency
Analog In Speed setting signal (0 - 10 V, 0...20 mA, 0...100 % PWM)
Ustart Startvoltage
Foff Shutdown Freq.
Fon: Switch on Freq.
Fedge Edgefrequency
Fmax Max. Frequency
L linear
Q Square (factory setting)

Due to technical reasons the output voltage amounts to approx. max. 95 % of the applied mains voltage.
In order to still be able to achieve the maximum airflow of the connected fans, an increase of the maximum frequency is possible for our motors. For this, a current increase must be included in the calculation. It is necessary to optimize monitoring of motor current, output voltage, and speed using suitable measuring instruments.
The factory set values are for voltage controllable external rotor motors with 400 V / 50 Hz.
After verification of the motor specifications, adjustments are to be adapted, if applicable.

Motor rated voltage (see Rating plate)	Setting "Edgefrequency"	Setting "Max. Frequency"
3 ~ 400 V, 50 Hz	48.5 Hz	50 Hz
3 ~ 400 V, 50/60 Hz	48.5 Hz	60 Hz
3 ~ 400 V, 60 Hz	57 Hz	60 Hz

Startvoltage
The start voltage is used to apply enough torque to the motors to insure they will run at low speed.
Attention! In order to prevent over current and unnecessarily high thermal load of the motor, do not select to high a setting.
Adjustment range: 0 - 15 % (percentage of the maximum output voltage)
Factory setting: 0 %

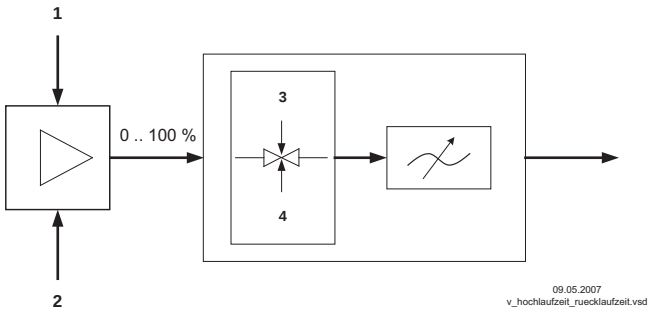


VF quadratic
U/f curve linear or square
Factory preprogrammed square characteristic curve "UF square" = "ON" for the operation of voltage controllable fans.
For operation with linear curve "UF quadratic" = "OFF "

8.7.4 Setting for Rampup time and Rampdown time

By separate menus for Rampup time and Rampdown time an adjustment is possible to individual system conditions.
This function is switched behind the actual controller function.

	Rampup time Time setting in which the automatic controller output from 0 % to 100 % rises. Setting range: 0...250 sec. Factory setting: 10 / 20 / 30 / 40 sec. (depending on device type)
	Rampdown time Time setting in which the automatic controller output from 100 % to 0 % reduces. Setting range: 0...250 sec. Factory setting: 10 / 20 / 30 / 40 sec. (depending on device type)



1 external Signal
2 Setting
3 Rampup time
4 Rampdown time

8.7.5 Setting Rolling direct.

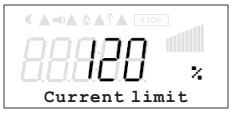
Attention!
It is essential to check the direction of rotation of the fan during the initial commissioning. To do this, note the direction of the arrow on the fan housing. We will not be responsible under any circumstances for warrantee for damage caused because the direction of rotation is wrong!

When connected in accordance with the connection diagram, the standard rotary direction “RIGHT” = CW results under factory settings. A change of direction is feasible by exchanging the phase sequence in the motor connection or through reprogramming.

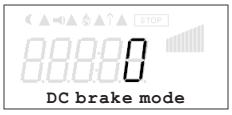
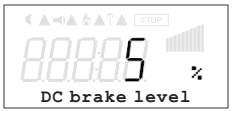
	By selection of the parameter “Direction of rotation” and following pressing the **P** key, the direction of rotation can changed to CCW for anti-“clockwise” = CCW direction of rotation. Pressing the **P** key causes the value that has been set to be accepted.	

If the rotary direction is reversed with an available modulation, it is initially reduced to “0” (disconnected) and subsequently increased back to the default value.

8.7.6 Setting Current limit

	As an additional safety function the device has a current limit, this can be adapted if necessary. The setting refers to the motor rated current of the device (100 % = setting: MotorRatedCurr.). On exceeding the percentage value set here, the modulation is reduced until the set current is set again. This prevents overloading of the motor. Setting range: 100...130 % Factory setting: 120 %
	Active current limit is signaled by a bright triangle in the display

8.7.7 Setting brake function

	**DC brake mode** Setting function of DC-brake for frequency inverters. For units that come with a factory engaged DC brake mode (if extant, ☞ DC brake mode setting), simultaneously activating the “DC brake mode ” only makes sense in exceptional cases. **0** = no brake function (factory setting). **1** = brakes before start (before modulation is returnd) If, under certain circumstances, the modulation switches back on while the motor is still rotating fast, this can result in a re-supply of the inverter’s “overcurrent disconnection”. The brake function can be activated to prevent this. This is then always active for an adjustable period before triggering starts. I.e., the brake function is always initiated before modulation after has it returned to “0”. The suitable adjustments depend on the centrifugal force of the motor and the conditions in the installation. **2** = Special function, brakes before stop (as soon as modulation “0”). The motor does not run out up to stop. The motor is braked actively, as soon as no modulation is present (Setpoint = “0” or Enable = “OFF”) . Test required. The “min. speed” adjustment must be set to “0”. Attention! With the frequently one behind the other following DC bracings it can come to strong heating up of the motor. To prevent any overheating, motor protection in the form of a temperature limiter installed in the motor is required (☞ motor protection).
	DC brake time Maximal length of DC-brake for frequency inverters. If the braking is activated, the d.c. brake torque is active for this time. Setting range: 0...250 sec. factory setting: 5 / 10 sec. (depending on device type)
	**DC brake level** Direct-current level, generated for braking. The higher this value, the greater the braking effect. The setting “DC brake level” refers in % to the value set in “MotorRated Curr.”. Setting range: 0...50 % / 25, 50, 75, 100 % (depending on device type) factory setting: 5 / 25 % (depending on device type) The setting is dependent on the size of the fan/motor. Attention! Too high values can lead to a considerable braking effect. Same setting affects also the function “Motorheating”(☞IO Setup).

	Active brake mode is signaled by a bright triangle in the display.

8.7.8 Motorheating

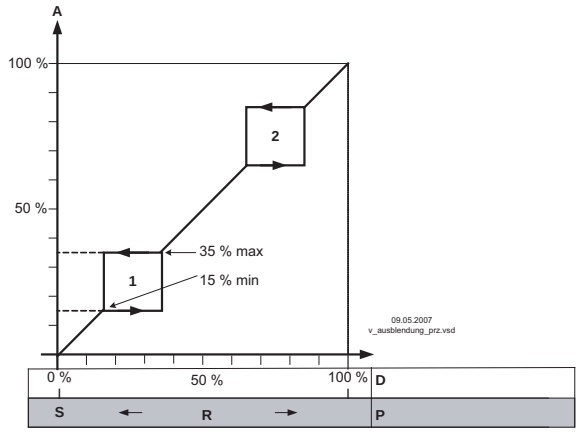
In order to avoid a sticking or a freezing of standing fans in cold environment, the “motor heating system” can be switched on.

	The motor heating function corresponds to the brake function in which a DC voltage brings the motor to a standstill (height of the “brake level”). This impresses a current that cannot cause the fan to rotate. The required voltage to prevent freezing depends on the ambient conditions and the technical data of the connected motors. Test the settings you have made under realistic conditions. The higher the output voltage adjustment, the greater the arising heating output (power loss) in the motor. The „motor heating“ or „standstill motor heating “ can only be active if no modulation is present due to closed-loop control. The motor heating can also be activated through the enable function (function 1D for a digital input) during shutdown. To exclude overheating, motor protection is required through the temperature monitor integrated in the motor (☞ Motor protection). The heating function is shut down if the motor protection function in the controller is activated. **OFF** = motor heating switched off (at the factory) **ON** = The motor heating becomes active automatically when there is no device modulation.

8.7.9 Suppression of speeds

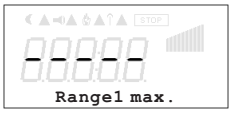
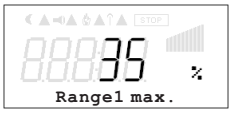
Suppression of up to three speed ranges.
Under certain circumstances, it is possible to prevent disturbing noises that can arise at certain speeds due to resonances.

Example for suppression of 2 ranges (Idealized principle diagram)



Setting depending on device type in: %, Hz, rpm

A Modulation
S Setpoint
R Pband
D Speed controller: setting signal
P P-controller: control deviation

	→	Factory setting no suppression active = “OFF”	→	
	→	Setting for “Range1 min.” Setting range: “Shutdown Freq.” - “Range 1 max.”	→	
	→	Setting for “Range1 max.” Setting range: “Range 1 max.” - “Max. Frequency”	→	
	→	Identical procedures for Suppression2 and Suppression3, as far as desired	→	etc.

9 Programming Icontrol Basic by hand held terminal A-G-247NW

9.1 Procedure for commissioning

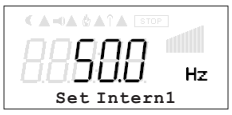
Sequence	Setting
1	Check if Thermostats or Thermistors of the motor are connected to input “TB/TP In”. If the motor protection function of the device is not neccesary the both terminals “TB / TP” have to be bridged.
2	Check if contact for enable is conected to “Digital In 1”. If the device remote control is not required, the two terminals “D1 / 24V” must be bridged or alternatively the function “Enable” deactivate ☞ IO Setup.
3	Check connection and close housing carefully.
4	Turn on mains voltage.
5	The settings in the **Motor Setup** depend on the type of motor connected. **5.1**: Setting motor rated current **5.2**: Setting motor rated voltage **5.3**: Setting Edgefrequency **5.4**: Setting maximum frequency Additional settings as required ☞Motor setup
Settings for U/f characteristic can only be made when no motor modulation is present!	
▷ Switch off via a digital input for remote control (enable= OFF). ▷ Reduce speed setting signal or setting value to “0” with the display depending on the control mode.	

9.2 Menu group Setting

Information

- **Factory setting**: Activation by external signal (0 - 10 V / PWM) at input “E1” (control mode = 0 ☞ Controller Setup). I.e. the following settings “Set Intern1”, “Set Intern2”, “Set Intern3” are not active!
- The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

Information

	Setting
	**Set Intern1** Setting only in Controlmode 4 active (☞ Controller Setup). Via the inputs “D1” / “E1” it is possible to switch to “Default Internal2” or “Default Internal3” (☞ IO Setup). Setting range manual speed setting: “Min. Speed” - “Max. Speed” Factory setting: 50.0 Hz (≙ Setting “Max. Speed”)
	Set Intern2 Setting only in control mode 6 active only in control mode 4, if activated via inputs “D1” / “E1” (☞ Controller Setup / IO Setup). Setting range manual speed setting: “Min. Speed” - “Max. Speed” Factory setting: 50.0 Hz (≙ Setting “Max. Speed”)
	Set Intern3 Setting only in control mode 6 active only in control mode 4, if activated via inputs “D1” / “E1” (☞ Controller Setup / IO Setup). Setting range manual speed setting: “Min. Speed” - “Max. Speed” Factory setting: 50.0 Hz (≙ Setting “Max. Speed”)

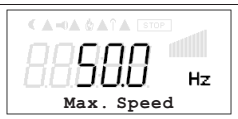
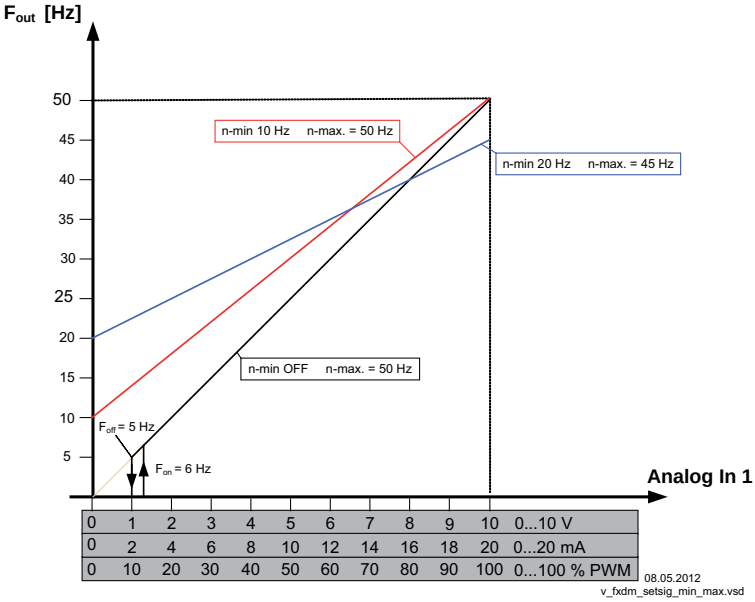
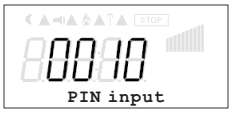
	Min. Speed (basic speed only when needed) Setting range: 0... “Max. Frequency” (☞ Motor Setup). Factory setting: 0.0 Hz Active in every control mode, priority by “Max. speed”.
	**Max. Speed** (speed limitation only when needed) Setting range: “Max. Frequency” (☞ Motor Setup)... “Min. Speed” Factory setting: 50.0 Hz Active in every control mode! Settings by “Max. frequency” are possible but are not made!

Diagram setting signal and output frequency



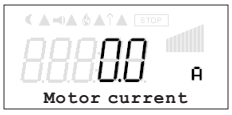
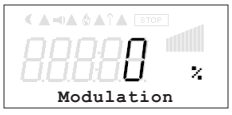
Fout: Output frequency
Analog In: Speed setting signal
n-min: Min. Speed
n-max: Max. Speed
Foff: Shutdown Freq.
Fon: Switch on Freq.

9.3 Menu group Start

	Start
	**PIN input** The service menu for the installation can be protected against unintentional changes by a pin code. With further pin codes putting back to pre-setting is possible.
	PIN 0010 Release of the service settings with programmed PIN-Accesslevel [0] (☞ “Controller Setup”). Menu groups Service: “Controller Setup”, “IO Setup”, “Motor Setup”
	PIN 1234 Opening “setting”. Release of the menu group for the user “setting” with programmed PIN-Accesslevel [0] (☞“Controller Setup”).
	PIN 9095 Load factory setting (exception, the menu language setting is retained). Only the parameters which are released by the currently set PIN-Accesslevel are loaded.

	Reset Complete re-start of the device
	Software version
	Parameter sets can be saved by the module in the terminal type A-G-247NW and transferred to other devices (☞ Operating Instructions Terminal Type A-G-247NW). Name parameterset with the keys ▼, ▲ + **P** and load in the terminal with the **P**-key.

9.4 Menu group Info

	Info
	Inverter output frequency.
	Display of motor current (Metering precision approx. +/-10%)
	Device modulation

9.5 Menu group Controller Setup

	Controller Setup

Information

The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

9.5.1 Controlmode

	Type of device modulation.
0	**Factory setting** Control by external signal (0 - 10 V / PWM) at the input “E1”. Switching to fixed speed “Default Internal2” or “Default Internal3” via digital input possible (☞ IO Setup).
1	no function
2	no function
3	no function

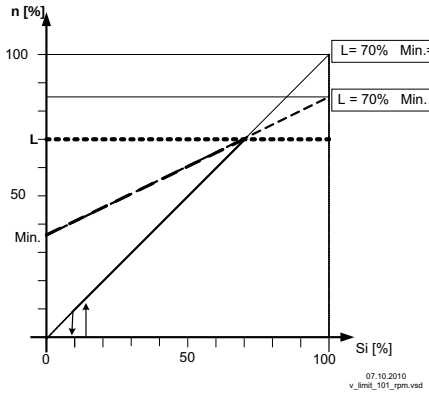
4	constant speed “Set Intern1”. Switching to fixed speed “Default Internal2” or “Default Internal3” via digital input possible (☞ IO Setup).
5	Fixed speed “Default Internal2” (without switching possibility to other default).
6	Fixed speed “Default Internal3” (without switching possibility to other default).

9.5.2 Limit

After allocation of a digital input (☞ IO Setup) an adjustable limitation of the modulation can be activated via a digital input.

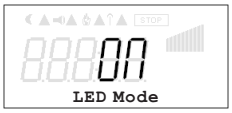
“Limit value” = max. possible modulation (e.g. speed reduction during night operation by time switch).
Setting range: 0 - 100 %
Factory setting: 75 % ≙ max. modulation, i. e. no limit.

Limit (idealized principle diagram)



n [%] Motor speed
L Limit
Si Setting signal speed

9.5.3 LED Mode



ON	Status LED in ECblue active i.e. operating conditions are indicated by flash code (factory setting).
OFF	Status LED not active, i.e. always OFF.

9.5.4 PIN-Accesslevel

The PIN-Accesslevel determines for which setting ranges a PIN must be entered.

PIN-Accesslevel	Function
2	**Factory setting** All menu groups are visible, settings are possible without a PIN.
1	• The menu group “Setting” is free, i.e. changes are possible without a PIN. • **PIN 0010**: for changes in the menu groups: “Controller Setup”, “IO Setup” and “Motor Setup” (these menu groups are not visible without a PIN).
0	**All settings are only possible after entering a PIN.** • **PIN 1234** for changes in the menu group: “Setting” • **PIN 0010**: for changes in the menu groups: “Controller Setup”, “IO Setup” and “Motor Setup” (these menu groups are not visible without a PIN).

Information
Changes for the PIN protection which effect a reduced access right only become active after switching off the device or executing the “Reset” (☞ Start menu group) function.

9.5.5 AM-MODBUS-W Wireless Communication

Parameter AM-MODBUS- W for the connection via radio to the hand held terminal A-G-247NW (☞ Installation / AM-MODBUS-W wireless communication) .

	Network Key (Radio key) Setting range: 0000 -9999 Factory setting: 9999
	Wireless channel Setting range: 0 - 15 Factory setting: 0

9.6 Menu group IO Setup

	IO Setup

Information
The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

9.6.1 Digital inputs “D1”(“E1” *)

	Different functions can be assigned to the digital inputs “D1” and “E1”*. Activation via floating contacts (a low voltage of approx. 24 V DC is connected). “D1” is programmed for the “Enable” function at the factory.
	For inverting switch to “ON”. The input inversion is set at the factory to “OFF” (when a function is programming).

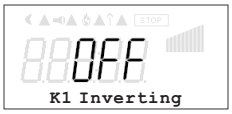
* *If the analogue input “E1” is not required for specifying the fan speed, this can be used as a digital input (☞ E1 function). The same functions can be assigned for “E1” as for “D1”.*

Attention!
Never apply line voltage to the digital input!

Function	Description
OFF	No function

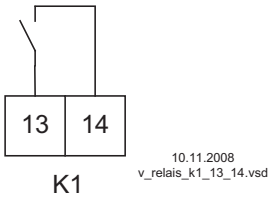
1D	**Enable ON / OFF (factory setting)** Remote ON/OFF (electronic disconnection) and Reset after a motor malfunction via floating contact. The power section is electronically disconnected. Operation of the device is still possible after pressing the “Esc” hotkey combination in switched-off condition. Signal- in and outputs remain active. A programmed alarm relay (factory set “K1 function” = 2K) does not report the switch-off. **Attention!** No disconnection (no potential isolation in accordance with VBG4 §6) in remote control of the device!
3D	**Limit ON / OFF** ☞ Controller Setup / Limit
5D	**Set Intern2** Fixed speed “Default Internal2” active. Function with selected “control mode”: 0, 1, 2 , 3 (☞ “Controller Setup”). With simultaneous activation of “Default Internal3” with function 6D , 5D has priority).
6D	**Set Intern3** Constant speed “Set Intern3”, also with selected “control mode”: 0 (☞“Controller Setup”).
13D	**Switch over direction of rotation** Switch over between direction of rotation “RIGHT” = CW and direction of rotation “LEFT” CCW . When“switching”over via a digital input, the device works with the opposite direction of rotation than the one set in Motor Setup. If the rotary direction is reversed with an available modulation, it is initially reduced to “0” (disconnected) and subsequently increased back to the default value.
15D	**Smoke extraction: Switch off temperature management, operation at max. speed** To make the ECblue as durable as possible, the devices have active temperature management. The modulation is reduced when internal temperature limits are exceeded. In venting systems in which the fan must run at max. speed in the event of a fire, the temperature management can be switched off by a digital input. At the same time, the fan is operated independently of the speed default for regular operation at maximum speed. The function is activated at the digital input with the contact open (at factory setting D1/E1 Inverting = OFF) so that the maximum speed of the fan is also possible with the line to the digital input interrupted in case of fire. **Attention!** The device and its internal components are no longer protected against overtemperature when this function is activated (this affects the life installation instructions ECblue). The motor protection function by connected thermal protector is no longer effective!

9.6.2 Relay outputs “K1”

	Various functions can be allocated to the relay outputs “K1”. This is preset at the factory for fault indication.
	Switch to “ON” for inversion (switch-time response depends on the allocated function). Fundamentally, the relay can only become operative if the electronic’s voltage supply is functioning. At least 2 current phases must be present! The factory preset is the inversion of relay “K1” to “OFF” (if a function has been programmed).

Function	Description
OFF	**No function** Relays remain always de-energized.

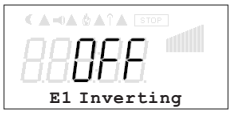
1K	**Operating indication** Operation without fault, reports enable “OFF”.
2K	**Fault indication (factory setting)** Pulled up in operation without fault, with release “OFF” not dropped out. Drops out at: line fault, motor fault, etc. ☞ Events / Fault indications
4K	**Limit** Alarm when the speed exceeds the value set under “Default Internal3” (☞ menu group “Setting”) (output power > 0 %). The function is active in every control mode (☞ menu group: “Controller Setup”).
17K	no function



K1
1 = energized, terminals 13 - 14 bridged
0 = de-energized 13-14 not bridged

Function	**Status Controller**	**K1** 1 = energized 0 = de-energized	
		Inverting	
		OFF	ON
1K	Operation without fault, line supply okay	**1**	0
2K	Fault with indication by relay	**0**	1
4K	Exceed Frequency / Speed > setting “Set Intern3”	**1**	0

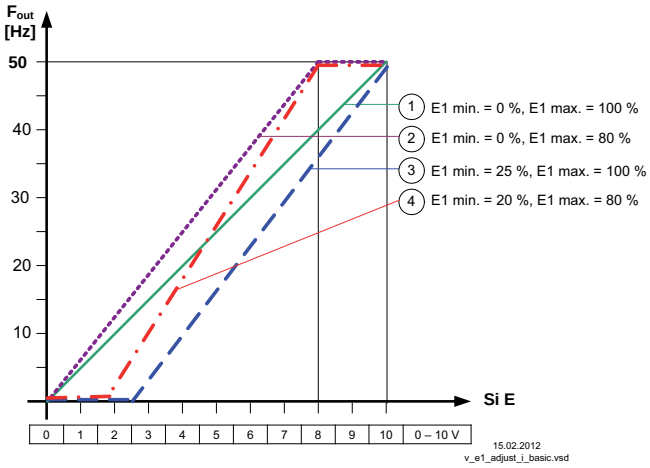
9.6.3 input “E1”

	E1 Function 1E (factory setting) = speed setting by external signal (0 - 10 V / PWM). For settings via 1E “E1” operates like “D1” as a digital input (☞digital inputs / function).
	**E1 Inverting** Factory setting inverting to “OFF”. For control with inverted setting signal switch to “ON” (setting signal: 10 - 0 V).

	E1 Min. Value of the input signal at which the controller starts at minimum modulation. Setting range: 0 - 100 % Factory setting: 5 %
	E1 max. Value of the input signal at which the maximum modulation of the controller is reached. Setting range: 0 - 100 % Factory setting: 100 %

Example for signal adaption

Idealized principle diagrams for setting: “Min. Speed” = 0.0 Hz and “Max. Speed” = 50.0 Hz



Example: “E1 min.” = 20 %
The controller begins only at approx. 20% higher signal with minimal modulation.

Example: “E1 max.” = 80 %
The modulation rises linear to 100% modulation with 80% setting signal.

Fout *Output frequency*
Si E *Setting signal speed*

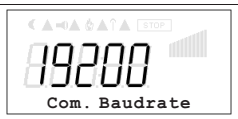
9.6.4 MODBUS communication watchdog

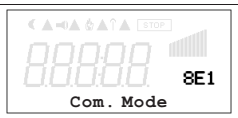
The MODBUS communication watchdog defines the behaviour in case of a communication fault.

	Watchdog Time If the device receives no message in the time window, a definable function is executed. Watchdog time in seconds. Setting range: 0 - 255 sec. Factory setting: 0 sec. = off
	Watchdog Mode Watchdog Mode: 0: No function (default) = OFF from FW 13 1: Fault (K1 function, h15) in case of communication fault (WDT) 2: Constant speed 1 * in case of communication fault (WDT) 3: Fault + constant speed 1 * in case of communication fault (WDT) 4: Fault by E1 Fault ** (only ECblue) 5: constant speed 1 by E1 Fault (only ECblue) 6: Fault constant speed 1 in case of E1 fault (only ECblue)
	* in this condition it is possible by digital input function 5, 6 or digital control function to change between the constant speeds (Holding register h4). ** E1 fault is triggered when E1 falls below E1 Min x 0.5. E1 fault is cancelled when E1 rises above E1 Min x 0.9.

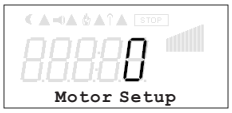
9.6.5 Networking via MODBUS

It is possible to network several devices with each other. The device uses the MODBUS-RTU as the protocol for the RS-485 interface.

	Bus Address The device address is factory set to the highest available MODBUS address: 247. Setting range MODBUS Address: 1 - 247.
	**UART Baudrate** Setting transfer rate Valid values: 4,800, 9,600, 19,200 Factory setting: 19200

	**UART Mode** Setting transfer format Valid values: 8O1, 8N1, 8E1 Factory setting: 8E1

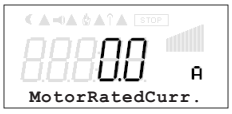
9.7 Menu group “Motor Setup”

	**Motor Setup**

Information
The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

Attention!
Settings for U/f characteristic may only be made when no motor modulation is present!

9.7.1 Setting motor rated current

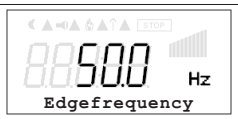
	**MotorRatedCurr.** **When commissioning, you must set the motor to the rated current stated on the rating plate.** Setting range: 0.0...device rated current / A Factory setting: device rated current

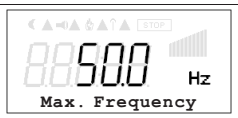
9.7.2 Setting motor rated voltage

	MotorRatedVolt. **When commissioning, you must set the motor to the rated voltage stated on the rating plate.** An adaptation can be made if the motor rated-voltage as the applied mains voltage is lower (e.g. 3 ~ 230 V motor on 3 ~ 400 V mains). Verify the output voltage using suitable measuring instruments. Setting range: 0...500 V Factory setting: 400 V

9.7.3 Adjustment of the U/f curve

Attention!
Settings for U/f characteristic can only be made when no motor modulation is present!

	**Edgefrequency** The maximum output voltage is attained during break edge frequency. Adjustment range: 1.0 - 120.0 Hz Factory setting: 50.0 Hz In the case of special settings with “Edge frequency” > “Max. frequency”, due to higher power losses it is possible that automatic power reduction occurs (☞ Messages and trouble shooting “Temp. Manager”).

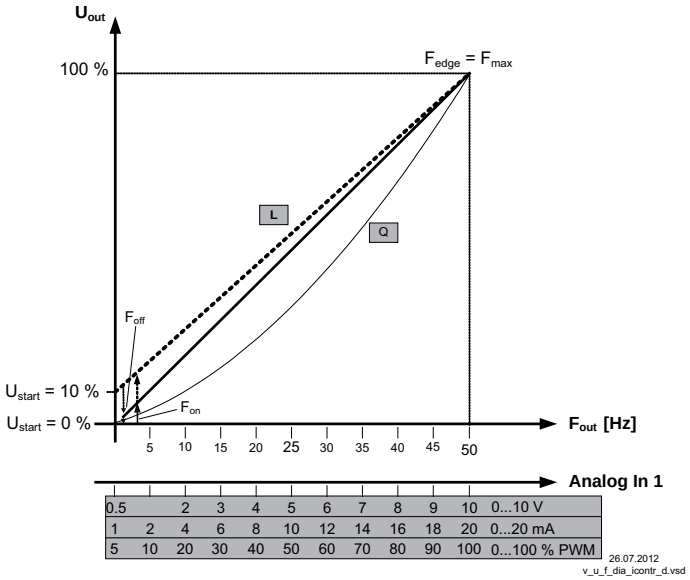


Max. Frequency

Above the Edgefrequency, the frequency is merely increased up to the Maximum frequency.

Adjustment range: 1.0 - 120.0 Hz

Factory setting: 50.0 Hz



Uout Output voltage
Fout: Output frequency
Analog In Speed setting signal (0 - 10 V, 0...20 mA, 0...100 % PWM)
Ustart Startvoltage
Foff Shutdown Freq.
Fon: Switch on Freq.
Fedge Edgefrequency
Fmax Max. Frequency
L Linear (factory setting)
Q Square

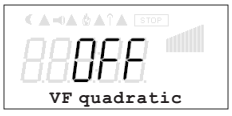
Startvoltage

The start voltage is used to apply enough torque to the motors to insure they will run at low speed.

Attention! In order to prevent over current and unnecessarily high thermal load of the motor, do not select to high a setting.

Adjustment range: 0 - 25 % (percentage of the maximum output voltage)

Factory setting: 0 %



VF quadratic

U/f curve linear or square

Factory setting“UF quadratic” = “OFF” i.e linear curve pre-programmed.

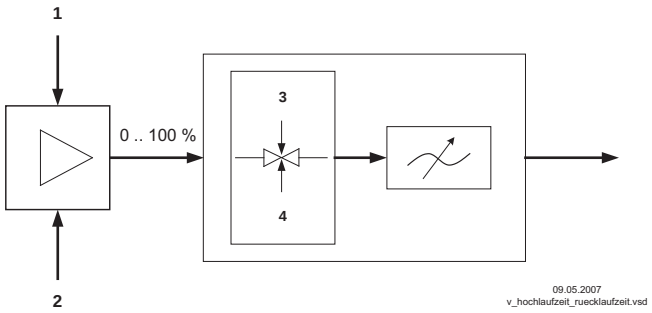
In the case of linear characteristic curves, the motor achieves full torque throughout the entire speed range. For fans operation a optimal speed control is generally achieved through this.

Switching over to square characteristic curve (only permisible in fans and pumps with square torque moment) might make sense in order to reduce the electromagnetic motor noises. “UF square”= “ON”

9.7.4 Setting for Rampup time and Rampdown time

By separate menus for Rampup time and Rampdown time an adjustment is possible to individual system conditions.
This function is switched behind the actual controller function.

	Rampup time Time setting in which the automatic controller output from 0 % to 100 % rises. Setting range: 0...250 sec. Factory setting: 10 / 20 / 30 / 40 sec. (depending on device type)
	Rampdown time Time setting in which the automatic controller output from 100 % to 0 % reduces. Setting range: 0...250 sec. Factory setting: 10 / 20 / 30 / 40 sec. (depending on device type)



1 external Signal
2 Setting
3 Rampup time
4 Rampdown time

9.7.5 Setting switching Frequency

	Switching Freq. Possible motor noises can be reduced by adjusting the clock frequency (16 kHz = upper limit of the human acoustic range). **Increasing of clock frequency only possible by reducing maximal load**. (☞ Maximum load depending on clock frequency and ambient temperature). Setting range: 8.0 / 10.0 / 16.0 kHz Factory setting: 8.0 kHz

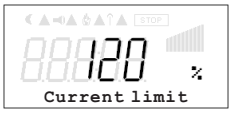
9.7.6 Setting Rolling direct.

Attention!
It is essential to check the direction of rotation of the fan during the initial commissioning. To do this, note the direction of the arrow on the fan housing. We will not be responsible under any circumstances for warrantee for damage caused because the direction of rotation is wrong!
When connected in accordance with the connection diagram, the standard rotary direction “RIGHT” = CW results under factory settings. A change of direction is feasible by exchanging the phase sequence in the motor connection or through reprogramming.

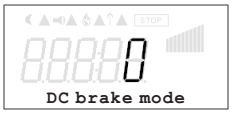
	By selection of the parameter “Direction of rotation” and following pressing the **P** key, the direction of rotation can changed to CCW for anti-“clockwise” = CCW direction of rotation. Pressing the **P** key causes the value that has been set to be accepted.	

If the rotary direction is reversed with an available modulation, it is initially reduced to “0” (disconnected) and subsequently increased back to the default value.

9.7.7 Setting Current limit

	As an additional safety function the device has a current limit, this can be adapted if necessary. The setting refers to the motor rated current of the device (100 % = setting: MotorRatedCurr.). On exceeding the percentage value set here, the modulation is reduced until the set current is set again. This prevents overloading of the motor. Setting range: 100...130 % Factory setting: 120 %
	Active current limit is signaled by a bright triangle in the display

9.7.8 Setting brake function

	**DC brake mode** Setting function of DC-brake for frequency inverters. For units that come with a factory engaged DC brake mode (if extant, ☞ DC brake mode setting), simultaneously activating the “DC brake mode ” only makes sense in exceptional cases. **0** = no brake function (factory setting). **1** = brakes before start (before modulation is returnd) If, under certain circumstances, the modulation switches back on while the motor is still rotating fast, this can result in a re-supply of the inverter’s “overcurrent disconnection”. The brake function can be activated to prevent this. This is then always active for an adjustable period before triggering starts. I.e., the brake function is always initiated before modulation after has it returned to “0”. The suitable adjustments depend on the centrifugal force of the motor and the conditions in the installation. **2** = Special function, brakes before stop (as soon as modulation “0”). The motor does not run out up to stop. The motor is braked actively, as soon as no modulation is present (Setpoint = “0” or Enable = “OFF”) . Test required. The “min. speed” adjustment must be set to “0”. Attention! With the frequently one behind the other following DC bracings it can come to strong heating up of the motor. To prevent any overheating, motor protection in the form of a temperature limiter installed in the motor is required (☞ motor protection).
	DC brake time Maximal length of DC-brake for frequency inverters. If the braking is activated, the d.c. brake torque is active for this time. Setting range: 0...250 sec. factory setting: 5 / 10 sec. (depending on device type)
	DC brake level Direct-current level, generated for braking. The higher this value, the greater the braking effect. The setting “DC brake level” refers in % to the value set in “MotorRated Curr.”. Setting range: 0...50 % / 25, 50, 75, 100 % (depending on device type) factory setting: 5 / 25 % (depending on device type) The setting is dependent on the size of the fan/motor. Attention! Too high values can lead to a considerable braking effect. Same setting affects also the function “Motorheating”(☞IO Setup).

	Active brake mode is signaled by a bright triangle in the display.

9.7.9 Setting Quench mode

If, under certain circumstances, the modulation switches back on while the motor is still rotating fast, this can result in a re-supply of the inverter's "overcurrent disconnection".
The quench modus is available to prevent this from happening ("quench" = synchronizing the rotating magnetic field generated by the frequency inverter with the momentary speed of the triggered motor). If this function is activated, the frequency inverter's rotating magnetic-field speed is synchronized with the motor's field at the start of every triggering (nominal value and modulation must have been „0" beforehand). Switchover into "normal mode" is automatic after the synchronization is completed.

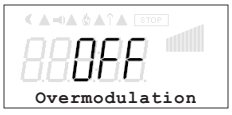
Attention!
Due to the transient motor triggering with maximum frequency at reduced output voltage necessary for the quench mode, short-term start-up can occur in a stationary motor with low centrifugal force.

The quench function can be combined with motor braking (DC brake mode). However, running both functions successively increases the time span until the motor is reaccelerated. For normal use, it is recommended to use only the quench mode.

	Selection of function for Quench mode **ON** = Ouench mode ON (factory setting) **OFF** = Ouench mode OFF
	Active Quench mode is signaled by a bright triangle in the display.

9.7.10 Setting Overmodulation

In the as-delivered state the maximum output voltage for operation without overmodulation is approx. 95 % of the applied mains voltage.
In operation with overmodulation the maximum output voltage can reach about the level of the applied mains voltage. Since resonance vibrations can occur in operation with overmodulation, the appropriate instructions in the motor or fan documentation must be observed!

	**OFF** = Overmodulation switched off (factory setting) **ON** = Overmodulation switched on

Attention!
- **In operation with overmodulation, you must make sure that resonance vibrations cannot increase. Speed ranges (frequencies) can be faded out in the following settings.**
- **The notes on mechanical vibrations and operation with overmodulation in the assembly and operating manual of the drive must be observed!**

9.7.11 Motorheating

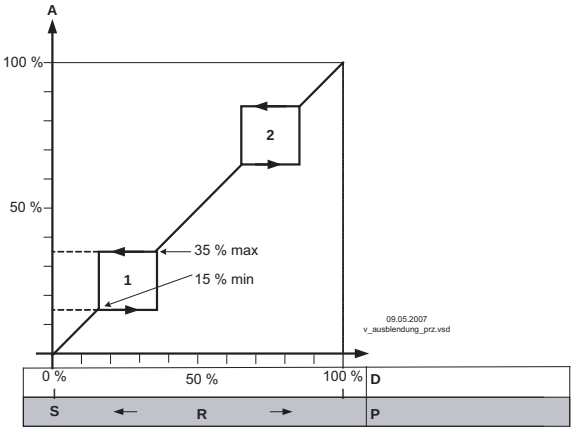
In order to avoid a sticking or a freezing of standing fans in cold environment, the “motor heating system” can be switched on.

	The motor heating function corresponds to the brake function in which a DC voltage brings the motor to a standstill (height of the “brake level”). This impresses a current that cannot cause the fan to rotate. The required voltage to prevent freezing depends on the ambient conditions and the technical data of the connected motors. Test the settings you have made under realistic conditions. The higher the output voltage adjustment, the greater the arising heating output (power loss) in the motor. The „motor heating“ or „standstill motor heating “ can only be active if no modulation is present due to closed-loop control. The motor heating can also be activated through the enable function (function 1D for a digital input) during shutdown. To exclude overheating, motor protection is required through the temperature monitor integrated in the motor (☞ Motor protection). The heating function is shut down if the motor protection function in the controller is activated. **OFF** = motor heating switched off (at the factory) **ON** = The motor heating becomes active automatically when there is no device modulation.

9.7.12 Suppression of speeds

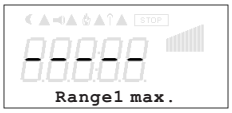
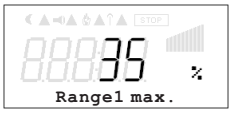
Suppression of up to three speed ranges.
Under certain circumstances, it is possible to prevent disturbing noises that can arise at certain speeds due to resonances.

Example for suppression of 2 ranges (Idealized principle diagram)



Setting depending on device type in: %, Hz, rpm

A Modulation
S Setpoint
R Pband
D Speed controller: setting signal
P P-controller: control deviation

	→	Factory setting no suppression active = “OFF”	→	
	→	Setting for “Range1 min.” Setting range: “Shutdown Freq.” - “Range 1 max.”	→	
	→	Setting for “Range1 max.” Setting range: “Range 1 max.” - “Max. Frequency”	→	

	→	Identical procedures for Suppression2 and Suppression3, as far as desired	→	etc.

10 Diagnostic with hand held terminal A-G-247NW

10.1 Diagnostic menu for ECblue Basic

The diagnostics menu supplies information about the momentary operating condition of the device.

Diagnostic	
32.0 °C IGBT Temp.	Display of the internal temperature of the power semiconductor.
32.0 °C Inside Temp.	Display of Inside Temp.
32.0 °C MCU Temp.	Display of the internal temperature of the microcontroller.
32.0 °C Motor Temp.	no function
0 % E1 Input	Signal height at analog input1“E1”.
565 V DC-Voltage	For 1 ~ types: DC-link voltage constantly approx. 400 V. For 3 ~ types DC-link voltage without load = peak value oft the input voltage. In a three-phase supply network with 400 V, an intermediate circuit voltage of ca. 565 V results. This voltage sinks slightly under load.
330 V Line voltage	Line voltage
0 Stateflags	Stateflags
0 Faultflags	Faultflags
2 PIN-Accesslevel	Momentarily adjusted PIN-Accesslevel (☞ Controller Setup).

10.2 Diagnostic menu for Fcontrol / Icntrol Basic

The diagnostics menu supplies information about the momentary operating condition of the device.

Diagnostic	
32.0 °C IGBT Temp.	Display of the internal temperature of the power semiconductor.
32.0 °C Capacitor	Display of Inside Temp.
32.0 °C MCU Temp.	Display of the internal temperature of the microcontroller.
32.0 °C Output filter	Only in version with integrated sine filter.
0 % E1 Input	Signal height at analog input1“E1”.
565 V DC-Voltage	The intermediate circuit voltage without load is the peak value of the input voltage. In a three-phase supply network with 400 V, an intermediate circuit voltage of ca. 565 V results. This voltage sinks slightly under load.
330 V Line voltage	Line voltage peak value.

0 Stateflags	Not active in devices with integrated display.
0 Faultflags	Not active in devices with integrated display.
2 PIN-Accesslevel	Momentarily adjusted PIN-Accesslevel (☞ Controller Setup).

11 Events / Fault signals

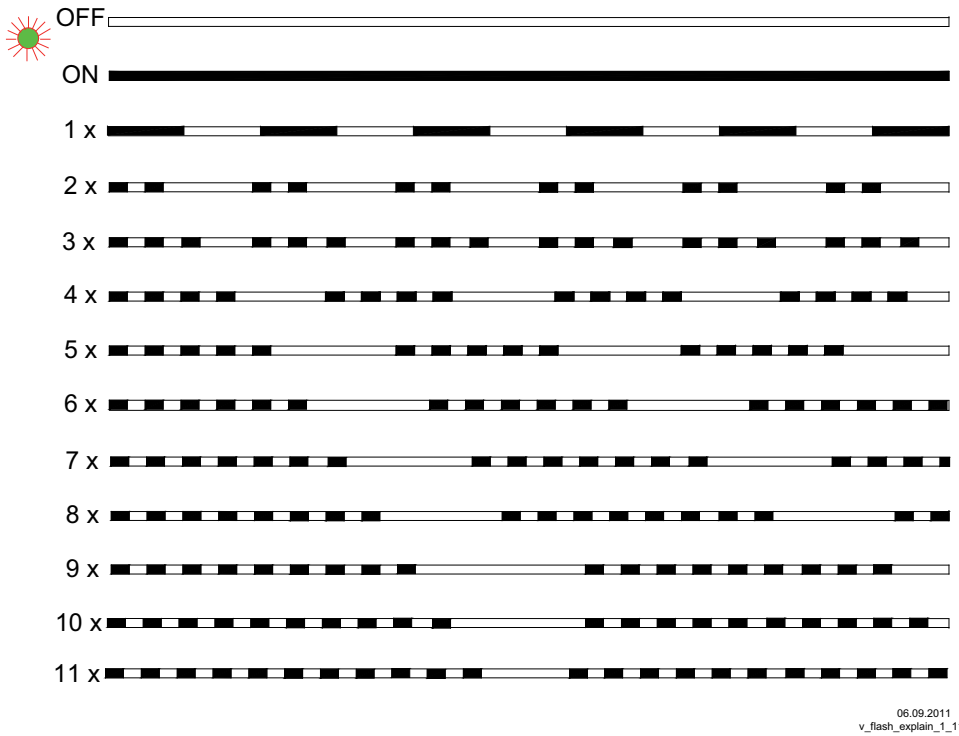
11.1 Display and query of events and malfunctions

Events	Menu group Events
	The event memory is read out after pressing the **P** key. Read »»»
0 Empty	Beispiel: keine vorliegenden Störungen Empty = no entry = no event in the memory
19 1 Line Fault	Example line fault Position 1 = latest event The last 10 (1 - 10) events are saved. The desired position can be selected with the ▼+ ▲ keys. 19 = number of all previous faults

An error message appears alternately with the actual value display (☞ Diagnostic faults).

11.2 Fcontrol / Icontrol Basic messages & troubleshooting

A momentary pending alarm or error message appears alternately with the standard display.
Operating conditions are indicated by the internal status LED with flashing code.
internal State LED



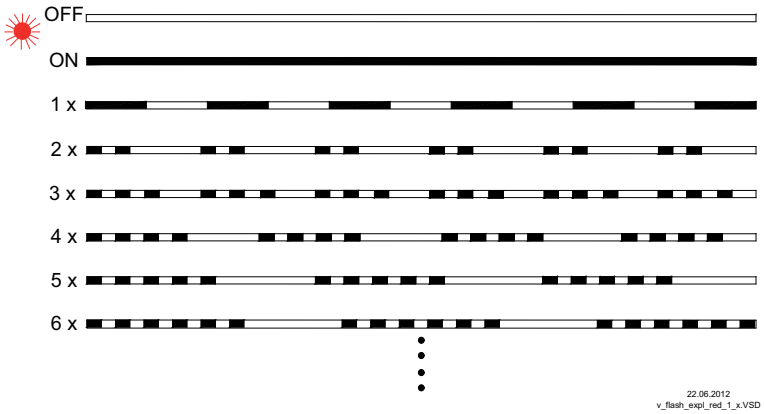
Display	Code	Relay K1	Explanation	Reaction of device Adjustment
	OFF	de-energized, 13 - 14 interrupted	no line voltage	In the event of a mains interruption the unit switches “OFF” and automatically “ON” when the voltage has been re-stored. Check line voltage and pre-fusing.
23.9 Hz Frequency	**ON**	energized 13 - 14 bridged	Normal operation without fault	
STOP	**1**	energized 13 - 14 bridged	**no enable = OFF** Terminals “D1” - “24 V” (Digital In 1) not bridged.	Switch off by external contact (☞ enable, device ON / OFF).

Display	Code	Relay K1	Explanation	Reaction of device Adjustment
Temp. Manager	**2**	energized 13 - 14 bridged	**Active temperature management** The device has an active temperature management to protect it from damage due to too high inside temperatures. In case of a temperature rise above the fixed limits, the modulation is reduced linearly. To prevent the complete system being switched off externally (in this operation permissible for the controller) in case of reduced operation due to too high an internal temperature, no fault message is sent via the relay.	With a drop in temperature the modulation rises again llinear. Check cooling of the controller.
Line Fault	**4**	de-energized, 13 - 14 interrupted	**line failure** The device is provided with a built-in phase-monitoring function for the mains supply. In the event of a mains interruption (failure of a fuse or mains phase) the unit switches off after a delay (approx. 200 ms). Only functioning with an adequate load for the controller.	Following a shutoff, a startup attempt is made after approximately 5 seconds, if the voltage supply is high enough. This keeps occurring until all 3 supply phases are available again. Check line voltage.
IGBT Fault	**6**	de-energized, 13 - 14 interrupted	**IGBT Fault** Earth fault or short-circuit at inverter output.	The device switches off, renewed attempt to start after about 60 s☞ Code 9. Final switch off when error is detected after the third start attempt at an interval < 60 s. Reset by enable or line voltage ON/OFF.
DC undervoltage	**7**	de-energized, 13 - 14 interrupted	**DC undervoltage** Intermediate circuit voltage below a fixed limit for longer than 75 s.	The modulation is switched off immediately at undervoltage, error message after 75 s. Automatic switching back on and switching off of error message when the voltage exceeds the fixed limit for at least 5 s. Check line voltage.
DC over voltage	**8**	de-energized, 13 - 14 interrupted	**DC over voltage** Intermediate circuit voltage above fixed limit for longer than 75s. Reason for excessively high line voltage or alternator motor operation.	The modulation is switched off immediately at overvoltage, error message after 75 s. Automatic switching back on and switching off of error message when the voltage drops below the fixed limit for at least 15 s. Check line voltage. Prevent generator motor operation.
IGBT warning	**9**	energized 13 - 14 bridged	**IGBT warning** IGBT cooling down period for approx. 60 sec.	Final shutoff after 2 cooling-off intervals ☞ Code 6.
Communication	**10**	de-energized, 13 - 14 interrupted	**Communication fault** MODBUS communication interrupted	☞ description MODBUS communication
Line undervolt.	**12**	de-energized, 13 - 14 interrupted	**line voltage too low** Line voltage below a fixed limit for longer than 75 s.	The modulation is switched off immediately at undervoltage, error message after 75 s. Automatic switching back on and switching off of error message when the voltage exceeds the fixed limit for at least 5 s. Check line voltage.

Display	Code	Relay K1	Explanation	Reaction of device Adjustment
Line over-voltage	**13**	de-energized, 13 - 14 interrupted	**Line voltage too high** Line voltage above fixed limit for longer than 75 s.	The modulation is switched off immediately at overvoltage, error message after 75 s. Automatic switching back on and switching off of error message when the voltage drops below the fixed limit for at least 15 s. Check line voltage.
Peak current	**14**	de-energized, 13 - 14 interrupted	**Error Peak current** If the output current increases above the specified limit (even in a short time-frame) the device will switch-off.	After a switch off the controller waits for 30 seconds then the controller attempt a start. If 10 switch offs take place consecutively within 60 s (time to next respective error), final switch off takes place with an error message. Should no further switch off be exceeded in 90 sec. the counter will be reset.
Motor fault	**15**	de-energized, 13 - 14 interrupted	**Motor fault** A connected thermostat or thermistor has tripped the circuit or interruption between both terminals “TB / TP”. Plug for “TP” or “TP” in wrong positions.	The unit cuts out and does not switch on again. Check motor and connection then reset (☞ Motor protection).
Output filter	**16**	de-energized, 13 - 14 interrupted	**Sine filter to hot** (only in version with integrated sine filter)	Switch off at to high temperature, restarting after cooling down. Check temperature in controller, Check cooling of the controller.
Overload	**17**	de-energized, 13 - 14 interrupted	**Overload fault** The controller was switched off by the current limitation.	The error is set after detecting 4 times (I^2t-process; maximum overload applied for 60 s). After every detection (IGTB Recovery Flag is set) there is a 30 s wait until a new attempt is started. The respective errors must alway have a shorter interval than 5 minutes (started after restart). The modulation is switched off immediately after every detection. Check load of the device. Reset by enable or line voltage ON/OFF.

11.3 ECblue Basic messages & troubleshooting

Status LED integrated in the cover



Display	Code	Relay K1	Explanation	Reaction of device Adjustment
	OFF	de-energized, 11 - 14 interrupted	no line voltage	Line voltage available? Unit switch OFF and automatically ON when the voltage has been restored
23.9 Hz Frequency	**ON**	energized, 11 - 14 bridged	Normal operation without fault	
STOP	**1**	energized, 11 - 14 bridged	**no enable = OFF** Terminals “D1” - “24 V” (Digital In 1) not bridged.	Switch off by external contact (☞ enable, device ON / OFF).
Temp. Manager	**2**	energized, 11 - 14 bridged	**Active temperature management** The device has an active temperature management to protect it from damage due to too high inside temperatures. In case of a temperature rise above the fixed limits, the modulation is reduced linearly. To prevent the complete system being switched off externally (in this operation permissible for the controller) in case of reduced operation due to too high an internal temperature, no fault message is sent via the relay.	With a drop in temperature the modulation rises again llinear. Check cooling of the controller
HALL-IC Error	**3 x**	de-energized, 11 - 14 interrupted	**HALL-IC** Incorrect signal from the Hall-ICs, error in the commutation. Internal plug connection faulty.	The controller switches the motor off. Automatic restart if no faults are recognised. Replace fan / motor
Line Fault	**4 x**	de-energized, 11 - 14 interrupted	**Line failure** (only for 3 ~ types) The device is provided with a built-in phase-monitoring function for the mains supply. In the event of a mains interruption (failure of a fuse or mains phase) the unit switches off after a delay (approx. 200 ms). Only functioning with an adequate load for the controller.	Following a shutoff, a startup attempt is made after approximately 15 seconds, if the voltage supply is high enough. This keeps occurring until all 3 supply phases are available again. Check power supply
Motor blocked	**5 x**	de-energized, 11 - 14 interrupted	**Motor blocked** If after 8 seconds of commutation no speed is measured > 0, the fault “Motor blocked” is released.	EC-Controller switches off, renewed attempt to start after about 2.5 sec. Final shutoff, when fourth starting test fails. It is then necessary to have a reset by disconnecting the line voltage. Check if motor is freely rotatable.

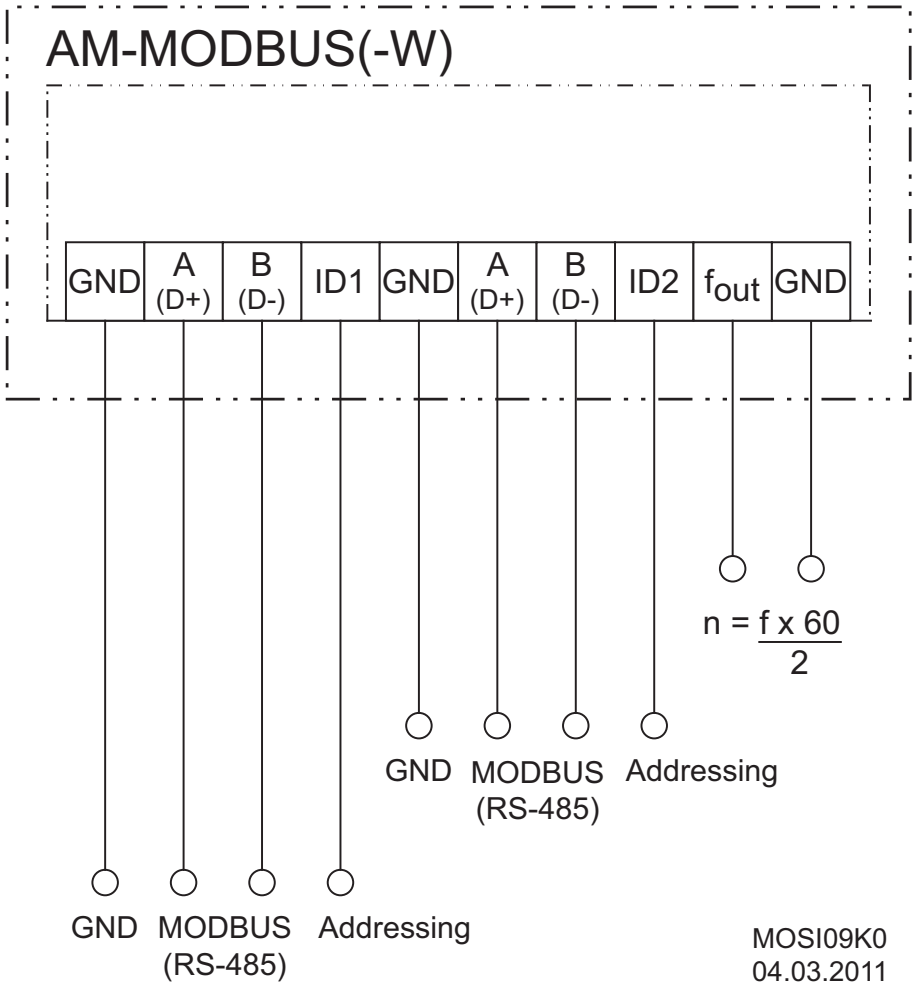
Display	Code	Relay K1	Explanation	Reaction of device Adjustment
IGBT Fault	**6 x**	de-energized, 11 - 14 interrupted	**IGBT Fault** Short circuit to earth or short circuit of the motor winding.	EC-Controller switches off, renewed attempt to start after about 60 sec. ☞ Code 9. Final shutoff, if - following a second starting test – a second fault detection is detected within a period of 60 seconds. It is then necessary to have a reset by disconnecting the line voltage.
DC undervoltage	**7**	de-energized, 11 - 14 interrupted	**DC undervoltage** If the DC-link voltage drops below a specified limit the device will switch off.	If the DC-link voltage rises above the limit within 75 seconds, then the cotroller will attempt to start. Should the DC-link voltage stay for more than 75 seconds below the limit, the device will switch off with a fault message.
DC over voltage	**8 x**	de-energized, 11 - 14 interrupted	**DC over voltage** If the DC-link voltage increases above a specified limit, the motor will switch off. Reason for excessively high input voltage or alternator motor operation.	If the DC-link voltage drops below the limit within 75 seconds, then the cotroller will attempt to start. Should the DC-link voltage stay above the limit for more than 75 seconds, the device will switch off with a fault message.
IGBT warning	**9 x**	energized, 11 - 14 bridged	**IGBT cooling down period**	IGBT cooling down period for approx. 60 sec. Final shutoff after 2 cooling-off intervals ☞ Code 6.
Communication	**10**	de-energized, 13 - 14 interrupted	**Communication fault** MODBUS communication interrupted	☞ description MODBUS communication
Motor start error	**11 x**	de-energized, 11 - 14 interrupted	**Fault motor start** If a starting command is given (enable available and Setpoint > 0) and the motor does not start to turn in the correct direction within 5 minutes, then an error message will appear.	If it is possible to start the motor in the target direction of rotation after the error message, the error message will disappear Should a voltage interruption occur in the meantime, the time taken up to the switch off will begin again. Check if motor is freely rotatable. Check if the fan is driven in reverse direction by an air stream (☞ Behaviour in rotation by air current in reverse direction).
Line undervolt.	**12 x**	de-energized, 11 - 14 interrupted	**line voltage too low** If the DC-link voltage drops below a specified limit the device will switch off.	If the line voltage rises above a specified limit within 75 seconds, then the controller will attempt to start. Should the line voltage stay below the specified limit for more than 75 seconds, the device will switch off with an error message.
Line overvoltage	**13 x**	de-energized, 11 - 14 interrupted	**Line voltage too high** Cause to high input voltage If the line voltage increases above a specified limit, the motor will switch off.	If the line voltage drops below the specified limit within 75 seconds, then the controller will attempt to start. Should the line voltage stay above the specified limit for more than 75 seconds, the device will switch off with an error message.
Peak current	**14 x**	de-energized, 11 - 14 interrupted	**Error Peak current** If the motor current increases above the specified limit (even in a short timeframe) the device will switch-off.	After a switch off the controller waits for 5 seconds then the controller attempt a start. Arises within 60 sec. in series 5 further disconnections a5final switch off with fault indication follows. The counter will be reset if there are no further switch offs within 60 seconds.

Display	Code	Relay K1	Explanation	Reaction of device Adjustment
Overload	**17 x**	de-energized, 11 - 14 interrupted	**Temperature alarm** Excess of the max. permissible inside temperature.	Controller switches off motor. Automatic restarting after cooling down. Check cooling of the controller

* *K1: programmed function at factory: Fault indication not inverted*

12 Enclosure

12.1 Connection diagram



fout Tacho output only active when used in ECblue

Information
The full connection diagram for the terminating device is a combination of the connection diagram of the module plus the connection diagram of the device in which the module is installed (☞ appropriate operating instructions).

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12.3 Manufacturer reference CE

Our products are manufactured in accordance with the relevant international regulations. If you have any questions concerning the use of our products or plan special uses, please contact:

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Telefax: +49 (0) 7940 16-504
info@ziehl-abegg.de
http://www.ziehl-abegg.com

12.4 Service information

If you have any technical questions while commissioning or regarding malfunctions, please contact our V-STE support department for control systems - ventilation technology.
Our worldwide contacts are available in our subsidiaries for deliveries outside of Germany. ☞ www.ziehl-abegg.com.
If you make returns for inspections or repairs we need certain information in order to facilitate focused trouble shooting and fast repair. Please use our repair tickets for this. It is provided to you after you have consulted our support department.
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